BRITISH MUSEUM (NATURAL HISTORY)

SPECIAL GUIDE No. 4

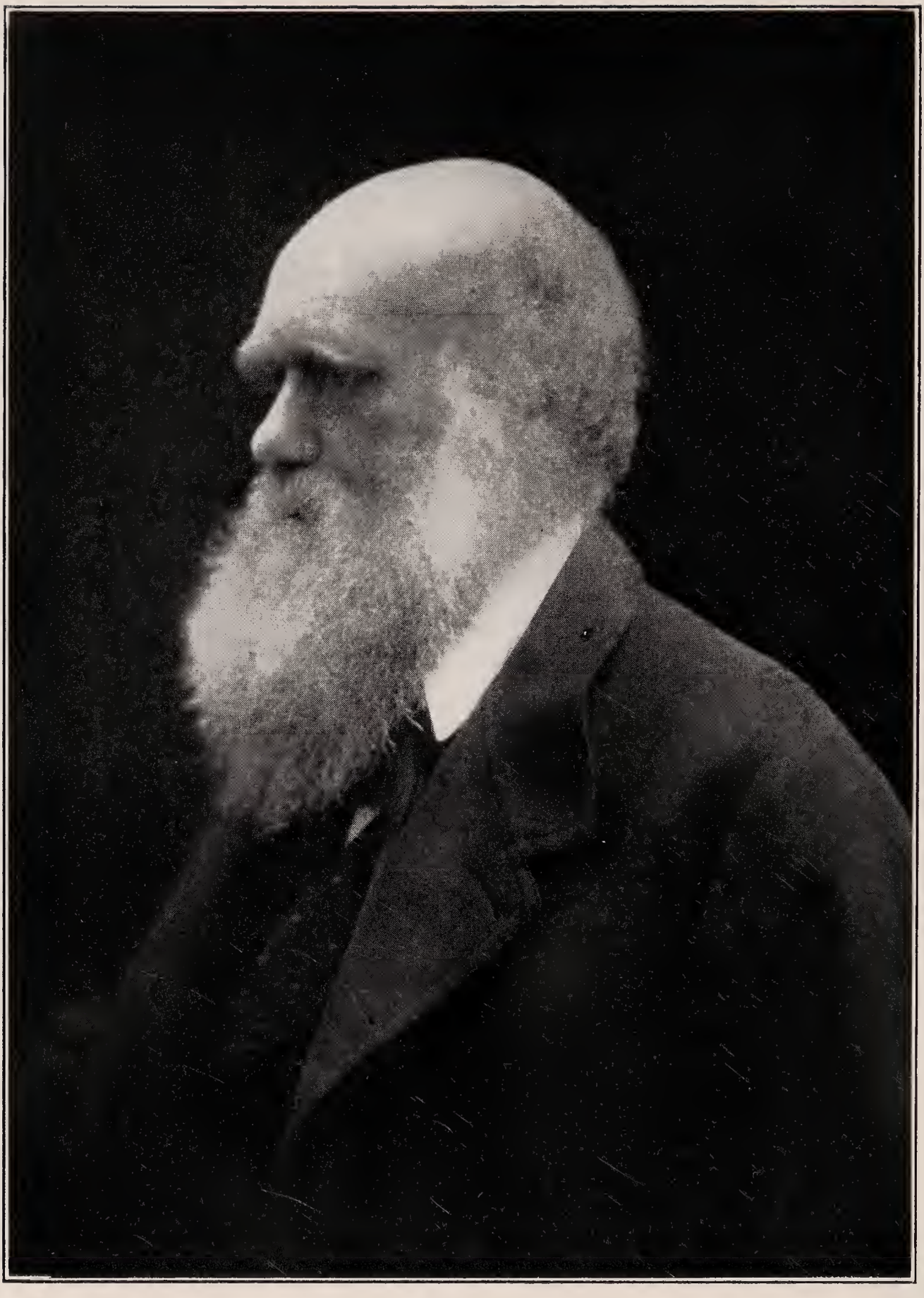
16

MEMORIALS OF CHARLES DARWIN

A COLLECTION OF MANUSCRIPTS PORTRAITS MEDALS BOOKS AND NATURAL HISTORY SPECIMENS TO COMMEMORATE THE CENTENARY OF HIS BIRTH AND THE FIFTIETH ANNIVERSARY OF THE PUBLICATION OF "THE ORIGIN OF SPECIES"

LONDON
PRINTED BY ORDER OF THE TRUSTEES
OF THE BRITISH MUSEUM
1909

[PRICE SIXPENCE]



CHARLES DARWIN.

Photograph by MRS. CAMERON, about 1868.
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PREFACE.

BY a coincidence rare in the records of previous celebrations, the year 1909 is at the same time the hundredth anniversary of the birth of a great man and the fiftieth anniversary of the completion of his greatest work. Charles Robert Darwin was born in 1809, and "The Origin of Species" was published in 1859. In recognition of this double motive for signalising the present year, the Trustees directed that an exhibition should be prepared of specimens, autograph letters, books and portraits relating to Darwin.

It is not the part of a Museum to endeavour to decide whether the share ascribed by Darwin to the operation of Natural Selection in the evolution of animals and plants was or was not correctly estimated. Some of the leading Biologists of the present day are in this respect even more Darwinian than Darwin himself, while others attribute less importance than he did to the principle of Natural Selection. But whatever view may be taken of this question, the magnitude of Darwin's influence on contemporary thought can hardly be overestimated, and the desirability of illustrating his teaching can scarcely be questioned.

Without necessarily implying any expression of opinion on controversial matters, it has thus seemed best to illustrate some of Darwin's arguments by means of specimens, using as far as possible the species to which he himself referred in his writings, and in some cases the material which actually passed through his hands. In this part of the Exhibition, the attempt is made to place before the public a few selected examples, to enable those who read Darwin's works to see some of the evidence on which he relied. The "Origin of Species" was naturally chosen in the first instance for illustration: though references to other works are given here and there. Possibly some few of the illustrations may not be well known even to experienced Zoologists and Botanists. It should be understood that the

exhibition makes no claim to be regarded as more than a very small selection, not to be taken as a complete illustration of Darwin's work.

Another set of specimens has a more personal interest, since they were collected by Darwin or are known to have been studied by him. With these may be noticed some of Darwin's apparatus, and a glance will show how simple were the tools with the aid of which his most famous observations were made.

The selection of autograph letters includes some of special interest. Attention may be directed to Nos. **1**, **3**, **2**, in the catalogue, consisting of Professor Henslow's invitation to Darwin to take part in the *Beagle* voyage, of Darwin's summary of his father's objections to the proposal, and of Josiah Wedgwood's reply to those objections. The characteristic and remarkable letter from Huxley (No. **18**), written immediately after his first perusal of the "Origin of Species," is one that specially deserves attention.

The exhibition further contains a number of portraits of Darwin, one or two medals founded in his honour, and copies of his printed books. With these are shown a few works, such as those by Haeckel, Weismann and others, which have special reference to Darwin's theories. It will readily be understood that these do not pretend to constitute more than a fraction of the enormous literature that has sprung into existence as the result of the publication of the "Origin of Species."

The greater number of the specimens and books, and a few of the MSS. are the property of the British Museum. For other specimens, as well as for most of the MSS. and portraits and for a few of the books, the Museum is indebted to the owners whose kindness in lending the relics is acknowledged in the pages of this Guide. Special thanks are due to the Council of the Royal College of Surgeons for their loan of the fossils collected by Darwin in South America; and to Mr. William Darwin, Professor Sir George Darwin, K.C.B., F.R.S., Mr. Francis Darwin, F.R.S., Major Leonard Darwin, and Mr. Horace Darwin, F.R.S., for various objects connected with their father's life. To Mr. J. C. Simpson, of Emmanuel College, Cambridge, the Museum is specially indebted for having made arrangements which facilitated the borrowing of some of the objects which were exhibited at Cambridge in June.

In the following catalogue of the exhibits, the source from which the object was obtained is indicated in the case of every specimen or paper borrowed for the occasion. The absence of any such acknowledgment may be taken to imply that the object belongs to the British Museum.

The frontispiece of this Guide is a reduced reproduction of a photograph taken about 1868 by Mrs. J. M. Cameron, Freshwater, Isle of Wight, lent for the purpose by Mr. Francis Darwin, and published by kind permission of Mr. John Murray. The other plate, facing page 7, is a photographic reproduction of the statue of Darwin, by Sir J. E. Boehm, R.A., on the main staircase at the North end of the Central Hall.

The arrangement of the specimens for exhibition, and the preparation of this Guide-book are the work of Dr. W. G. Ridewood.

SIDNEY F. HARMER,
Keeper of Zoology.

British Museum (Natural History),
London, S.W.
July, 1909.

LIFE OF DARWIN.

Charles Robert Darwin was born at Shrewsbury on February 12th, 1809. He was the son of Robert Waring Darwin, a Doctor of Medicine of Shrewsbury, and grandson of Dr. Erasmus Darwin, poet and philosopher, probably best known as the author of "Loves of the Plants." On leaving the Grammar School at Shrewsbury in October, 1825, Darwin went to Edinburgh University to study medicine. His father, however, perceiving that he did not relish the idea of becoming a physician, proposed that he should become a clergyman, and with that intent Darwin went to Cambridge early in 1828, and remained there three years. He left Cambridge to join the *Beagle* as naturalist of the expedition, and was away from England from December, 1831 to October, 1836.

On his return from the *Beagle* voyage Darwin settled in Cambridge, and in March, 1837, took lodgings in Great Marlborough Street, London, where he stayed two years till his marriage in January, 1839. He married his cousin, a grand-daughter of Wedgwood, the famous potter. He had by this time finished the "Journal" of the *Beagle* voyage (republished later as "A Naturalist's Voyage Round the World"), and was preparing his "Geological Observations," which were produced in the form of three books, in 1842, 1844 and 1846 respectively; and he was also engaged in editing the "Zoology of the Voyage of H.M.S. *Beagle*," which appeared in five parts between 1839 and 1843. He lived in Upper Gower Street from January, 1839, to September, 1842, when he moved to Down, in Kent, where he remained for the rest of his life. In October, 1846, he began his study of the Cirripedia, upon which he wrote four volumes (1851–1854).

The idea of selection by nature had been working in his mind since the voyage of the *Beagle*. The succession of the great extinct Edentates of the Pampas of Argentina by the modern Armadillos, and the peculiarities of the fauna of the Galapagos Archipelago, the productions of each island of which differ slightly

from those of the other islands, pointed to species being capable of modification, in a gradual manner. But he admitted to being puzzled by structural features specially adapted to habits and surroundings, such as the modification of the feet and tail-feathers of the woodpecker for climbing trees, and of hooks and plumes of seeds for dispersal. He commenced to accumulate a vast mass of evidence to show the extent to which artificial selection by man has resulted in the production of varieties among domesticated animals and cultivated plants, and in 1838, after reading the "Essay on the Principles of Population," by Thomas Malthus, in which the struggle for existence among human beings is clearly set forth, he conceived the idea that a similar struggle among animals and plants had led to the extinction of those individuals which were least fitted to their environment, and that by differentiation, resulting from the action of different environmental conditions on organisms at first similar, new species had come into existence. In June, 1842, he first committed his ideas on the subject to paper, and this first draft, of thirty-five pages, he rewrote and expanded to 230 pages in 1844.

When it became known in 1858 that Alfred Russel Wallace had independently arrived at somewhat similar conclusions, it was arranged by Lyell and Hooker that Darwin and Wallace should expound their views jointly at a meeting of the Linnean Society. The title of the joint paper was "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection."

In the following year Darwin produced his "Origin of Species," a book which in his autobiography of 1876 he admits to be the chief work of his life. The first edition (1250 copies) was sold out on the day of its production, November 24th, 1859, and Darwin immediately set to work to revise the book for a second edition, which appeared on January 7th, 1860, and consisted of 3000 copies. The sixth and last edition was published in January, 1872, and of this numerous reprints have been issued.

In 1860 Darwin began arranging his notes for the "Variation of Animals and Plants under Domestication," a work which appeared in 1868. In 1862 he published his book on the "Fertilisation of Orchids," and afterwards his papers, read before the Linnean Society, on dimorphism in *Primula* and trimorphism in *Lythrum*. His paper on "Climbing Plants" in 1865 was reproduced in book form in 1875.

He published the "Descent of Man" in 1871, the "Expression of the Emotions" in the autumn of 1872, "Insectivorous Plants"

in 1875, the "Effects of Cross and Self-Fertilisation in the Vegetable Kingdom" in 1876, the "Different Forms of Flowers on Plants of the Same Species" in 1877, the "Power of Movement in Plants" in 1880, and the "Formation of Vegetable Mould through the Action of Worms" in 1881.*

Darwin was awarded the Royal Medal of the Royal Society in 1853, and the Copley Medal in 1864, and the Wollaston Medal of the Geological Society in 1859. He died at the age of 73 on April 19th, 1882, and was buried in Westminster Abbey.

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* A complete list of Darwin's books and his contributions to scientific periodicals is to be found at the end of the third volume of the "Life and Letters of Charles Darwin," by his son, Francis Darwin, 1887.

DARWIN EXHIBITION.

LIST OF CASES, IN NUMERICAL ORDER.

The special cases containing the specimens illustrative of Darwin's life and work are indicated by pale green labels. To facilitate the finding of any particular case they are numbered in as consecutive a manner as their positions will permit. It is not recommended, however, that the visitor should proceed from case to case in the numerical sequence; it is intended that the exhibits shall be reviewed in the order in which they are referred to in the descriptive "List of Exhibits" (p. 7 *et seq.*).

Case **1.** A large frame on the right-hand side of the Eastern * arch leading to the North Hall, containing Manuscripts of Darwin.

Case **2.** The North wall-case of Bay VI,† containing a series of Burrowing Animals, an illustration of "adaptive modification."

Case **3.** An upright table-case on the East side of the main staircase, containing Manuscripts and Books by Darwin, or connected with Darwin's life and work.

Case **4.** An upright, shallow case set obliquely across the entrance of Bay VI, containing Medals and Portraits of Darwin, and other photographs and sketches of interest in connection with Darwin's life and work.

Case **5.** A frame on the North side of the arch of Bay VII, containing a series of feathers of the Peacock illustrating "gradation in ornament." ("Descent of Man." Chap. xiv.)

Case **6.** The North wall-case in Bay VII, containing at the left-hand end and on the floor specimens collected by Darwin, or studied by him; and in the remainder of the case specimens illustrating passages in Darwin's books.

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* The entrance to the Museum is at the *South* end of the Central Hall, and the main staircase is at the *North* end; the side of the Hall to the right of the visitor on entering is the *East*.

† The Bays or Recesses around the Central Hall are denoted by numerals. On the East side, the Bay nearest the Huxley statue is No. X, and that by the side of the main staircase is No. VI.

Case **7.** An upright table-case in Bay VII, containing specimens, chiefly Insects, illustrating protective coloration, warning coloration, and mimicry.

Case **8.** A small black case containing a microscope, set on a table at the end of Bay VII. In this case are shown specimens of avicularia and vibracula of Polyzoa.

Case **9.** The South wall-case in Bay VII, containing a series of specimens illustrating passages in Darwin's books, more particularly the "Origin of Species"; a continuation of the series shown in Case **6.**

Case **10.** A frame on the South side of the arch of Bay VII, containing a series of feathers of the Argus Pheasant. ("Descent of Man." Chap. xiv.)

Case **11.** A black table-case set across the entrance to Bay VIII, containing the fossil remains of extinct Mammals collected by Darwin in South America in 1833.

Case **12.** The North wall-case in Bay IX, containing a series of specimens in continuation of those shown in Cases **6** and **9.**

Case **13.** A horizontal table-case in Bay IX, containing on the one side specimens of Cirripedia or Barnacles studied by Darwin during the years 1846–1854, and described in his monograph on that group of animals; and on the other side specimens of Corals collected by Darwin at Keeling Island in 1836.

Case **14.** An upright case near the foot of the staircase, containing a series of Desert Animals, showing the uniform sandy coloration which renders these animals so little conspicuous in their natural surroundings.

Case **15.** An upright case containing a series of animals, principally Birds and Mammals, exhibiting albinism.

Case **16.** An upright case containing Birds and Mammals exhibiting melanism.

Case **17.** An upright case containing typical specimens of the Carrion Crow (*Corvus corone*) and Hooded Crow (*Corvus cornix*), and a map showing the distribution of each species; also examples of Birds exhibiting characters intermediate between those of the two species, obtained from a region where both species occur and interbreed. The same case contains a series of Goldfinches exhibiting characters intermediate between those of the Common Goldfinch (*Carduelis elegans*) and the Himalayan Goldfinch (*Carduelis caniceps*),

obtained from a region where the geographical areas of the two species overlap.

Case **18.** An upright case containing in the upper part the wild Rock Pigeon (*Columba livia*), and below examples of the principal breeds of domestic Pigeon, illustrating the great variation which a species may exhibit in a state of domestication by careful selective breeding. ("Animals and Plants under Domestication." Chaps. v and vi.)

Case **19.** A table-case near the Owen statue, containing models and specimens illustrating the Fertilisation of Flowers. ("Fertilisation of Orchids," 1862, and "Cross and Self Fertilisation of Flowers," 1876.)

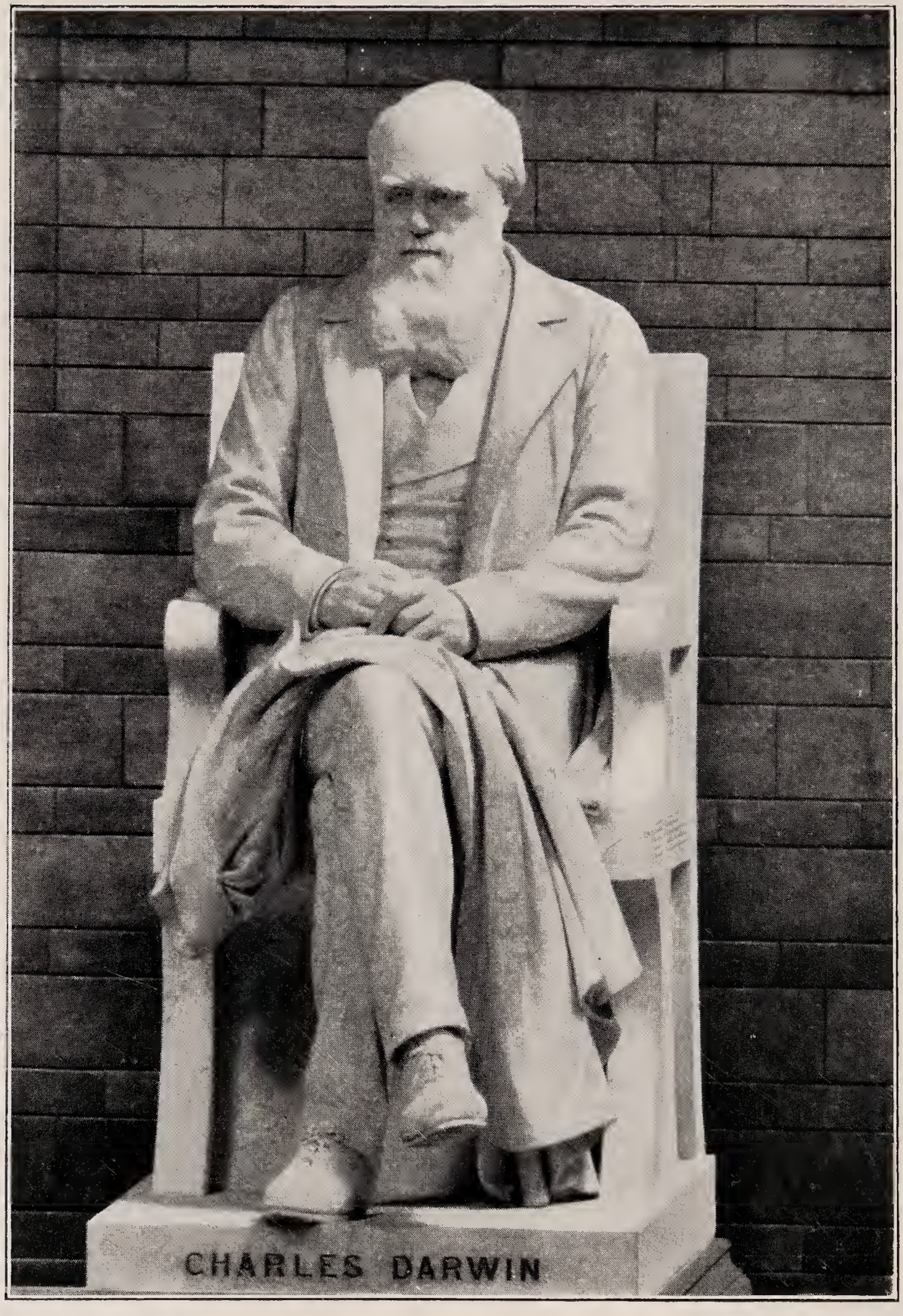
Case **20.** A table-case containing models and specimens illustrating the structure of Insectivorous Plants. ("Insectivorous Plants," 1875.)

Case **21.** An upright case containing examples of the Red Jungle Fowl of India, and specimens of the principal breeds of domestic Fowl, illustrating the great variation which a species may exhibit in a state of domestication by careful selective breeding. ("Animals and Plants under Domestication." Chap. vii.) The case also contains a series of wild and domestic Canaries.

Case **22.** An upright case containing Ruffs and Reeves (*Pavoncella pugnax*), showing the remarkable difference in the plumage of the two sexes, and the variability of that of the male, during the breeding season.

Case **23.** An upright case containing Drakes and Ducks (*Anas boscas*), showing the remarkable difference in the plumage of the two sexes during the breeding season.

Cases **24** and **25.** Upright cases containing Mammals and Birds from Norway, illustrating the adaptation of the colour of the coat to that of the natural surroundings, by virtue of which the animals are rendered less conspicuous to their enemies, or to their prey. In Case **24** the animals are shown as they appear in summer; in Case **25** as they appear in winter.



Statue by Sir Joseph Boehm, R.A., 1885.
Photograph by Mr. H. G. Herring.

LIST OF EXHIBITS.

STATUE.

At the top of the first flight of stairs at the North* end of the Central Hall, a sitting statue of Darwin executed by Sir J. E. Boehm, R.A., as part of the "Darwin Memorial" raised by public subscription. It was unveiled on June 9th, 1885, when an address was delivered on behalf of the Memorial Committee by the late Professor Huxley, Pres. R.S., to which His Majesty the King (then Prince of Wales), representing the Trustees, replied. A photographic reproduction of the statue faces this page.

MANUSCRIPTS.

In Case **1**, a large frame on the right-hand side of the Eastern arch leading from the Central Hall to the North Hall :—

1. A letter, dated August 24th, 1831, from Henslow to Darwin, inviting him to travel as naturalist on the *Beagle*. Darwin was eager to accept, but his father objected, in the terms set forth in MS. No. **3** here shown. The objections were submitted to Darwin's uncle, Josiah Wedgwood, whose reply is here shown (No. **2**). Lent by Francis Darwin, Esq., F.R.S.

2. A letter from Josiah Wedgwood (second son of the distinguished potter) to Darwin's father, which decided the latter to allow his son to go on the *Beagle* expedition. Dated August 31st, 1831. Lent by Francis Darwin, Esq., F.R.S.

3. A manuscript by Charles Darwin detailing his father's objections to his going on the *Beagle* voyage. Lent by Francis Darwin, Esq., F.R.S. This paper was submitted to Josiah Wedgwood, when his advice was solicited, and it is referred to in Wedgwood's reply here shown (No. **2**). The objections are as follows :—

"1. Disreputable to my character as a Clergyman hereafter.

"2. A wild scheme.

"3. That they must have offered to many others before me the place of Naturalist.

"4. And from its not being accepted there must be some serious objection to the vessel or expedition.

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* See footnote, p. 4.

"5. That I should never settle down to a steady life hereafter.
"6. That my accommodations would be most uncomfortable.
"7. That you should consider it as again changing my profession.
"8. That it would be a useless undertaking."

4. Four pages of zoological notes on *Aplysia*, *Planaria*, and *Cleodora*, made by Darwin during the voyage of the *Beagle*. They are dated February, 1832. Lent by Francis Darwin, Esq., F.R.S.

5. A list of the officers and men of the *Beagle*, dated October, 1836, *i.e.*, on the completion of the voyage. Darwin's name occurs at the top of the left-hand column. Lent by Francis Darwin, Esq., F.R.S.

6. A letter from Darwin to Owen, dated Thursday 28th, 36, Gt. Marlboro' St., referring to the return of the proof-sheets of Owen's paper on *Toxodon*, which were submitted to Darwin for criticism. The date is probably 1837.

7. A letter from Darwin to George R. Gray, of the British Museum, thanking him for a copy of his book on the "Genera of Birds," and expressing a hope that he would now be free to complete the volume of the *Beagle* Birds left unfinished by John Gould. The date of the letter is probably 1840.

8. A letter from Darwin to Owen referring to a weathered Elephant's tooth and a tusk from Peru. Judging from the address (12, Upper Gower Street) the date of the letter is between 1839 and 1842.

9. A letter from Darwin to Daniel Sharp dealing with foliation, cleavage, stratification, volcanic rocks, and other geological matters. The letter bears the postmark November 2nd, 1846.

10. A hitherto unpublished letter bearing the post-mark August 2nd, 1843, written by Darwin to G. R. Waterhouse (afterwards of the British Museum), and expressing his views as to what should be aimed at in classifying animals and plants. He writes: "All rules for a natural classification are futile until you can clearly explain what you are aiming at. Until that is done I must protest against sameness of country (as with the Monotremata) being used. . . . I believe . . . that if every organism which ever had lived or does live were collected together (which is impossible, as only a few can have been preserved in a fossil state), a perfect series would be presented, linking all, say the Mammals, into one great, quite indivisible group." Lent by C. O. Waterhouse, Esq.

11. A letter from Darwin to Owen, saying that Captain Sulivan, R.N., had arrived in London with six casks of fossil bones from the southern part of Patagonia, and expressing a wish to examine the bones with Owen, when they had been unpacked at the Royal College of Surgeons Museum. Date probably between 1840 and 1850.

12. A letter from Darwin to Owen, dated "Nov. 25th, Down, Farnborough, Kent," asking for the loan of some Barnacles from the College of Surgeons Museum. Date between 1846 and 1851.

13. A hitherto unpublished letter, bearing the post-mark July 27th, 1843, written by Darwin to G. R. Waterhouse (afterwards of the British Museum). Darwin writes, in reference to a discussion on classification :—"It has long appeared to me that the root of the difficulty in settling such questions as yours—whether number of species, etc., etc., should enter as an element in settling the value or existence of a group—lies in our ignorance of what we are searching after in our natural classification. . . . According to my opinion . . . classification consists in grouping beings according to their . . . descent from common stocks. . . . There is one caution . . . the great doubt whether the groups which are now small may not have been at some former time abundant, and you will admit fossil and recent beings all come into one system. . . . Perhaps if the Goatsucker and Woodpecker were varied into very many genera, and very many species of each, they would be looked on as orders equal to the Hawks, etc." Lent by C. O. Waterhouse, Esq.

14. The first page of Darwin's 1844 sketch of his theory on the origin of species. The first clear conception of the theory occurred to Darwin at the end of 1838, or the beginning of 1839, but he did not set it out in writing till June, 1842. The 1842 draft consisted of 35 pages, and this was rewritten and expanded to 230 pages in the summer of 1844. The manuscript shown is the first page of the 1844 draft. Lent by Francis Darwin, Esq., F.R.S.

15. A letter from Darwin to Owen, asking for a specimen of *Balanus glacialis* from the College of Surgeons Museum. The left-hand half of the letter is a personal one to Owen, the right-hand half is a formal application which Owen might lay before the Council of the College if the sanction of that body were necessary. The date is probably 1852 or 1853.

16. A letter from Darwin to S. P. Woodward, of the British Museum, best known as the author of the "Manual of the Mollusca."

In this letter Darwin expresses his inability to accept the view (Carpenter's, 1844) that the Hippuritidæ are in any way a connecting link between the Oysters and the Barnacles. The date is probably 1854. Lent by B. B. Woodward, Esq.

17. A letter from Darwin to S. P. Woodward, in which he discusses the relative antiquity of volcanoes, and expresses his disagreement with Von Buch's "elevation-crater-theory." The date is about 1860. Lent by B. B. Woodward, Esq.

18. A letter from Huxley to Darwin, dated November 23rd, 1859, in which he states that he has finished reading the "Origin of Species," and expresses the pleasure that the new views have given him. He advises Darwin not to be annoyed by the abuse which is doubtless in store for him, and assures him that he can rely upon the support of his friends. The letter is published in "Life and Letters of Charles Darwin," by F. Darwin, Vol. ii, pp. 231–2. Lent by Francis Darwin, Esq., F.R.S.

19. A letter from Darwin to Owen, dated December 13th, 1859, referring to the "Origin of Species," which had appeared during the preceding month. The letter is published in "The Life of Richard Owen," by R. Owen, 1894, Vol. ii, pp. 90–91.

20. A letter from Darwin to G. R. Waterhouse, of the British Museum, concerning "the eldest son of Sir J. Lubbock," the present Lord Avebury, whom he wished to propose for membership of the Entomological Society. Date, 1850.

21. A letter written by Darwin in 1854 or 1855 to William Harris, of Charing, Kent, from whom he had borrowed some Cirripedes to study when writing his monograph on that group of animals. Lent by C. D. Sherborn, Esq.

22. A long letter from Darwin to a correspondent whose name does not appear on the letter, and who was evidently opposed to the views expressed in the "Origin of Species." Darwin writes that as the undulatory theory of light is based on analogy with the passage of sound waves through air, so he defends his theory of natural selection by analogy with artificial selection. In the latter part of the letter he states that he did not discuss "alternation of generations," because he looked upon the non-sexual reproduction as a process of gemmation during a larval stage, and that the life-history as a whole does not differ essentially from one in which there is no alternation. The date of the letter is probably 1861.

23. A letter from Darwin to Owen, dated "Saturday evening,

Down, Farnborough, Kent," referring to negotiations for the purchase of a skeleton of the Sabre-toothed Tiger, *Machairodus*, offered by Señor F. Muniz, and to a translation into English of a Spanish paper on these remains.

24. A letter from Darwin to Samuel Butler thanking him for a copy of a work of his, probably either "Erewhon" (1872) or "The Fair Haven" (1873), both of which were published under the initials "S. B." Darwin states that he would not have suspected Butler as the author of the book. The date of the letter is probably 1872 or 1873.

MANUSCRIPTS (*continued*), BOOKS,* Etc.

In Case **3**, a large table-case standing on the Eastern side of the main staircase :—

25. An early note-book of Darwin's containing observations made when he was at Edinburgh in March 1827. On the right-hand page shown he describes his discovery of the young of the Skate-leech, *Pontobdella muricata*. Lent by Francis Darwin, Esq., F.R.S.

26. Darwin's pocket-book, containing notes made in September, 1834, while at Santiago, during the voyage of the *Beagle*. Most of the notes are geological, but some refer to the natural history of the country. Lent by Francis Darwin, Esq., F.R.S.

27. Darwin's pocket-book, containing notes on the geological structure of the Coquimbo valley made after the arrival of the *Beagle* at Valparaiso in July, 1834. The notes are in pencil throughout, and each page is scored across, presumably to denote that a copy had been made. Lent by Francis Darwin, Esq., F.R.S.

28. Letters written by Darwin during the voyage of the *Beagle* to Professor Henslow, who read them at a meeting of the Cambridge Philosophical Society in November, 1835, and had them printed for distribution among the members of the Society.

29. Twenty-four pages of notes of Insects caught during the voyage of the *Beagle*. The corrections and additions are in Darwin's handwriting. The capture of live beetles in the sea at a distance of seventeen miles from land, here recorded, is published in the "Naturalist's Voyage round the World," p. 159 of the 1882 edition.

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* Only a selected series of Darwin's books and scientific papers is here shown; a complete list of his writings is to be found at the end of Vol. iii of the "Life and Letters of Charles Darwin," by F. Darwin, 1887. A large proportion of the books in Case **3** are books on Darwinism, and other writings inspired by Darwin's work.

30. Microscope used by Darwin on the *Beagle*. Lent by Sir George H. Darwin, K.C.B., F.R.S.

31. Microscope used by Darwin. Lent by Sir George H. Darwin, K.C.B., F.R.S.

32. Simple microscope used by Darwin on the *Beagle*. Lent by Sir George H. Darwin, K.C.B., F.R.S.

33. (At the top of the case). Dissecting microscope used by Darwin. Lent by Francis Darwin, Esq., F.R.S.

34. A volume of notes on Reptiles, etc., made on the *Beagle* expedition, those on the left-hand page shown being in Darwin's handwriting. Date, September, 1835 ; locality, Galapagos Islands. The first note on the page has reference to the Sea Iguana, *Amblyrhynchus cristatus*, a lizard of which Darwin gives a figure in the "Naturalist's Voyage round the World," p. 385. (A stuffed specimen of the lizard is shown in Case **12**.) Of further interest is the pencil note on the right-hand page allotting specimen 1315, another *Amblyrhynchus*, for dissection by Mr. Owen.

35. Darwin's "Naturalist's Voyage round the World" or "Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage of H.M.S. *Beagle* round the World, under the command of Captain Fitzroy, R.N.," 1882. (The original appeared in 1839 in Vol. iii of the "Narrative of the Surveying Voyages of H.M.S *Adventure* and *Beagle*." It was issued separately as "Journal of Researches, etc.," and a second edition appeared in 1845, and was re-issued in 1860 with a postscript.) The book is opened at pp. 384–5, showing a figure of the Sea Iguana, *Amblyrhynchus cristatus*, mentioned in the MS. above.

36. "Zoology of the Voyage of H.M.S. *Beagle*," edited and superintended by Charles Darwin :

Part I. Fossil Mammalia, by Richard Owen, 1840.
Part II. Mammalia, by G. R. Waterhouse, 1839.
Part III. Birds, by John Gould (and G. R. Gray), 1841.
Part IV. Fish, by the Rev. Leonard Jenyns, 1842.
Part V. Reptiles, by Thomas Bell, 1843.

37. Darwin's "Structure and Distribution of Coral Reefs" ; being Part I of the Geology of the Voyage of the *Beagle*. London, 1842. (Republished with Parts II and III in 1851 ; Second Edition, 1874 ; Third Edition, 1889.)

38. Darwin's "Geological Observations on the Volcanic Islands

visited during the Voyage of H.M.S. *Beagle*"; being Part II of the Geology of the Voyage of the *Beagle*. London, 1844. (Republished with Parts I and III in 1851; Second Edition, with Part III, 1876.)

39. Darwin's "Geological Observations on South America"; being Part III of the Geology of the Voyage of the *Beagle*. London, 1846. (Republished with Parts I and II in 1851. Second Edition, with Part II, in 1876.) The three fossils figured in the left top corner of the plate shown are exhibited in Case **6**.

40. Several pages in Darwin's handwriting of an abstract of Pallas's "Mémoire sur la variation des animaux" (Acta Acad. Sci. Imp. Petropol., 1780). It is interesting as showing the kind of abstracts Darwin made of the books that he read. Lent by Francis Darwin, Esq., F.R.S.

41. Pallas's paper, "Mémoire sur la variation des animaux" (Acta Acad. Sci. Imp. Petropol., 1780), opened at pages 84 and 85 for comparison with the notes made by Darwin and shown in the manuscript above.

42. A note-book of Darwin's, dealing chiefly with expression. It bears the date 1838, and the address 36, Great Marlborough Street, and contains numerous references to information supplied by his father in the course of conversation. Lent by Francis Darwin, Esq., F.R.S.

43. A copy of questions on cross-breeding drawn up by Darwin for circulation among farmers and cattle-breeders. The questions are twenty-one in number, and are printed with a wide margin for replies. The copy is not dated, but since it is addressed from 12, Upper Gower Street, the date of issue is probably about 1840.

44. Darwin's "Monograph of the Sub-class Cirripedia, with Figures of all the Species." The Lepadidæ, or Pedunculated Cirripedes. London, 1851. (Ray Society.)

45. Darwin's "Monograph of the Sub-class Cirripedia, with Figures of all the Species." The Balanidæ, or Sessile Cirripedes, the Verrucidæ, etc. London, 1854. (Ray Society.)

46. Darwin's "Monograph of the Fossil Lepadidæ, or, Pedunculated Cirripedes of Great Britain." London, 1851. (Palæontographical Society.) "A Monograph of the Fossil Balanidæ and Verrucidæ of Great Britain." London, 1854. (Palæontographical Society.)

47. A letter from Darwin to Owen, dated July 17th, 1854, in reply to a letter from Owen complimenting him on his monograph on the Cirripedia. The letter is published in "The Life of Richard Owen," by R. Owen, 1894, Vol. i, pp. 407–8.

48. "The Life of Richard Owen," by R. Owen, Vol. i, p. 408, showing the letter from Darwin to Owen, of which the original is shown above.

49. Two selected pages of Darwin's copy of his letter to Prof. Asa Gray, dated September 5th, 1857, a letter which constituted part of the paper "On the Tendency of Species to form Varieties, and on the Perpetuation of Varieties and Species by Natural Means of Selection," which was communicated to the Linnean Society by Darwin and Wallace jointly on July 1st, 1858. The letter was published in the Journal of the Linnean Society, Zoology, Vol. iii, No. 9, 1858 [1859], pp. 50–53 (see copy here shown), and was republished in "The Darwin-Wallace Celebration" volume of the Linnean Society, 1908, pp. 95–98.

50. Journal of the Linnean Society, Zoology, Vol. iii, London, 1859. The copy is opened at pp. 50 and 51, showing the letter from Darwin to Asa Gray, of which the original MS. is here exhibited.

51. "The Foundations of the Origin of Species," being Darwin's 1842 preliminary sketch of the Origin of Species, edited by Francis Darwin, F.R.S., and printed by the Cambridge University Press, 1909. Copies of this book were presented by the Syndics of the University Press to the delegates and other guests at the Cambridge Darwin Commemoration, June 23rd, 1909.

52. Darwin's "On the Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life," London, 1859. (Second Edition, 1860; Third, 1861; Fourth, 1866; Fifth, 1869; Sixth, 1872.) The copy shown is of the first edition. Lent by J. C. Simpson, Esq.

53. A paper by Dr. W. C. Wells, entitled, "An Account of a Female of the White Race of Mankind, part of whose Skin resembles that of a Negro," a paper in which he recognises the principle of natural selection in the case of the different races of man, and compares it with the improvement of the varieties of domestic animals by selective breeding. The paper was read before the Royal Society in 1813, but was not published by that body; it appeared as part of Dr. Wells's book on "Single Vision, Dew, Letter to Lord

Kenyon, etc.," in 1818 (the book here shown). The paper was apparently unknown to Darwin at the time that he wrote the "Origin of Species." In the "Historical Sketch" at the beginning of the sixth edition of that work he gives a lengthy quotation from it, including the passage here marked.

54. Note B of the Appendix of Patrick Matthew's book on "Naval Timber and Arboriculture," 1831, in which a reference to Nature's method of elimination of the least fit is expressed in the words—"those individuals who possess not the requisite strength, swiftness, hardihood, or cunning falling prematurely without reproducing . . . their place being occupied by the more perfect of their own kind . . ." (p. 365). A similar statement occurs on p. 384, in a section of the Appendix devoted to the adaptation of living things to their environment.

Although Matthew's book was published in 1831, Darwin did not see it till April, 1860, after the appearance of the second edition of the "Origin of Species," when Matthew republished his views in the *Gardener's Chronicle*. Darwin at once wrote to the *Gardener's Chronicle* a letter, in which occur the words, "I freely acknowledge that Mr. Matthew has anticipated by many years the explanation which I have offered of the origin of species, under the name of natural selection."

55. A copy of the first edition of the "Vestiges of the Natural History of Creation," published anonymously in 1844, and attributed to various writers, but subsequently known to be the work of Robert Chambers. The author writes (p. 222): "The idea which I form of the progress of organic life upon the globe . . . is that the simplest and most primitive type, under a law to which that of like-production is subordinate, gave birth to the type next above it, that this again produced the next higher, and so on to the very highest, the stages of advance being in all cases very small—namely, from one species only to another; so that the phenomenon has always been of a simple and modest character." Since the book appeared after Darwin had rewritten and expanded the first draft of his views upon the origin of species, it cannot have influenced him much, but Darwin frankly admits, nevertheless, in the "Historical Sketch" in the sixth edition of the "Origin of Species," that the writer of the book "argues with much force on general grounds that species are not immutable productions."

56. A letter written by Darwin to Owen, giving the reference to the page in Hearne's "Travels" in which mention is made of

North American bears swimming in water and swallowing water-insects. Owen criticised Darwin for suggesting that this habit of the bear might in course of time lead to the evolution of a purely aquatic animal "like a whale" (see p. 25 of Owen's *Edinburgh Review* article here shown).

The letter also refers to a copy of Hunter's "Essays and Observations" which he was expecting to receive from Owen. The printed slip giving the address to which Darwin wished the book sent is interesting as showing the methodical habits of the writer.

Judging from the date of Owen's criticism and the date of the publication of Hunter's book, the letter was written in 1860.

57. Proof-sheets of the hostile "Edinburgh Review" article on the "Origin of Species," April 1860, found among the papers of Sir Richard Owen after his death. The article was not signed, but it was generally known to have been written by Owen.

58. Darwin's "On the Various Contrivances by which British and Foreign Orchids are fertilised by Insects, and on the Good Effect of Intercrossing," London, 1862. (Second Edition, 1877.) Lent by Dr. F. Ducane Godman, F.R.S.

59. "Für Darwin," by Fritz Müller, Leipzig, 1864. (A translation by W. S. Dallas was published in London, 1869, entitled "Facts and Arguments for Darwin."). The book deals mainly with Crustacea, and comprises a number of facts which support Darwin's theory of natural selection.

60. "The Darwinian Theory of the Transmutation of Species," examined by a Graduate of the University of Cambridge, London, 1867.

61. Darwin's "Variation of Animals and Plants under Domestication," 2 Vols., London, 1868. (Second Edition, 1875.)

62. "Natürliche Schöpfungsgeschichte," by Ernst Haeckel, Berlin, 1868. (A translation by Miss L. D. Schmitz was published in London in 1875 under the title, "The History of Creation.")

63. "Note alla Teoria Darwiniana," by Achille Quadri, Bologna, 1869.

64. Darwin's "Descent of Man, and Selection in Relation to Sex," 2 Vols., London, 1871. (Second Edition, in one volume, 1874.)

65. "Charles Darwin et ses précurseurs français," Etude sur le Transformisme, by A. de Quatrefages, Paris, 1870.

66. "Studien zur Descendenz-Theorie," by August Weismann, Leipzig, 1875–6. (A translation by R. Meldola was published in London in 1882 under the title "Studies in the Theory of Descent.")

67. A page of Darwin's manuscript of the "Expression of the Emotions," Chapter vi. It has reference to the shedding of tears and it shows the considerable amount of alteration to which the author subjected his original draft before he was satisfied with it. The date is probably about 1871. The copy of the "Expression of the Emotions" which is shown by the side of the manuscript is opened at the page where the particular passage occurs. Lent by Francis Darwin, Esq., F.R.S.

68. Darwin's "Expression of the Emotions in Man and Animals." London, 1872. (Second Edition, 1873.) The copy is opened at pp. 168–169, and the passage of which Darwin's manuscript is shown is marked in the margin.

69. A copy of the First Edition of the "Expression of the Emotions in Man and Animals," 1872, open to show Plate 1, with six figures of crying children. Lent by Dr. F. Ducane Godman, F.R.S.

70. "Le Darwinisme," by Emile Ferrière, Paris, 1872.

71. "Der Darwinismus und die Naturforschung Newtons und Cuviers," by Albert Wigand, Brunswick, 1874–1877.

72. Darwin's "Movements and Habits of Climbing Plants." London, 1875. (Second Edition, 1876; originally published in the Journal of the Linnean Society, Botany, ix, 1865.)

73. Darwin's "Effects of Cross and Self Fertilisation in the Vegetable Kingdom," London, 1876. (Second Edition, 1878.)

74. Darwin's "Insectivorous Plants." London, 1875. (Second Edition, 1875.)

75. Darwin's "Different Forms of Flowers on Plants of the same Species," London, 1877. (Second Edition, 1880.)

76. "The Power of Movement in Plants," by Charles Darwin, assisted by Francis Darwin, London, 1880.

77. Darwin's "Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits," London, 1881. (Second Edition, 1883.) Lent by J. C. Simpson, Esq.

78. "The Life and Letters of Charles Darwin," including an Autobiographical Chapter, by Francis Darwin, 3 Vols., London, 1887.

79. "Darwinism," an Exposition of the Theory of Natural Selection with some of its Applications, by Alfred Russel Wallace, London, 1889.

80. "From the Greeks to Darwin," by H. F. Osborn, New York, 1894 (Columbia University Series). Presented by Messrs. Macmillan & Co.

81. "Darwin and after Darwin," an Exposition of the Darwinian Theory and a Discussion of post-Darwinian Questions, by G. J. Romanes, 3 Vols., London, 1892, 1895 and 1897.

82. "More Letters of Charles Darwin," by F. Darwin and A. C. Seward, 2 Vols., London, 1903. Lent by Mr. John Murray.

83. "Essays on Evolution, 1889–1907," by E. B. Poulton, 1908. Lent by the Oxford University Press.

84. "The Darwin-Wallace Celebration," an account of the celebration held by the Linnean Society of London on July 1st, 1908, this being the fiftieth anniversary of the reading of the joint paper by Darwin and Wallace on July 1st, 1858. The joint paper is republished in this volume, and the speeches made by the seven medallists are recorded. Lent by Dr. S. F. Harmer, F.R.S.

85. "Catalogue of the Library of Charles Darwin, now in the Botany School, Cambridge," compiled by H. W. Rutherford, 1908.

86. "Darwin and Modern Science"; twenty-nine essays in commemoration of the centenary of the birth of Charles Darwin and of the fiftieth anniversary of the publication of the "Origin of Species"; edited by Prof. A. C. Seward, M.A., F.R.S.; Cambridge University Press, 1909.

87. Order of the Proceedings at the Darwin Celebration held at Cambridge, June 22–24, 1909; with a sketch of Darwin's life, and eleven plates. Presented by the Syndics of the University Press, Cambridge.

88. "Christ's College Magazine," Vol. xxiii, No. 70, Cambridge, 1909. Darwin Centenary Number. The book is opened at pp. 222–3, and shows a letter from Darwin to Wallace, April 6th, 1859, after the reading of their joint paper before the Linnean Society and before the publication of the "Origin of Species."

PORTRAITS, SKETCHES, MEDALS, Etc.

In Case **4**, an upright case at the entrance to Bay VI, the bay or recess opposite Case **3** :—

89. Water-colour sketch of the *Beagle* in Tierra del Fuego, drawn by —. Martens, artist on the *Beagle* expedition. Lent by Sir George H. Darwin, K.C.B., F.R.S.

90. Coloured print of Christ's College from the street, about Darwin's time. From R. Ackermann's "History of Cambridge," 1815; drawn by W. Westall, and engraved by Black. Lent by A. E. Shipley, Esq., F.R.S.

91. Coloured print of the Botanic Gardens, Cambridge, about Darwin's time. From R. Ackermann's "History of Cambridge," 1815; drawn by W. Westall, and engraved by J. Stadler. Lent by A. E. Shipley, Esq., F.R.S. The Botanic Garden here shown is the old Botanic Garden of the University, on the site of which most of the Museums and Laboratories were built later. The picture shows, in the middle, King's College Chapel (mentioned by Darwin as one of the things that gave him most pleasure in Cambridge), the tower of St. Bene't's Church (on the left), and that of Great St. Mary's, the University Church (on the right).

92. Portraits of seven generations of Darwins. Charles Darwin is the third of the series. To the left are his son George and grandson Charles; and to the right his father Robert Darwin, doctor of medicine, his grandfather Erasmus Darwin, author of "Loves of the Plants," Robert, the father of Erasmus, and William, the grandfather. Lent by Sir George H. Darwin, K.C.B., F.R.S.

93. Portrait of Darwin as a boy of seven, with his sister; reproduced from a small pastel drawing made in 1816 by Sharples, now in the possession of Miss Wedgwood of Leith Hill Place. Lent by Horace Darwin, Esq., F.R.S.

94. Portrait of Darwin's father, Robert Waring Darwin, M.D., F.R.S., born 1766, died 1846; mezzotint by Thomas Lupton, after the painting by James Pardon, Shrewsbury; published 1839.

95. A reproduction by Mr. Dew-Smith of a photograph of Darwin by Messrs. Maull and Fox, taken about 1854. The copy shown is from the "Annals of Botany," xiii, 1899; similar reproductions have appeared in "More Letters of Charles Darwin," 1903, and "Darwin and Modern Science," edited by A. C. Seward, 1909. A wood engraving of the photograph was published in *Harper's*

Magazine, October, 1884, and in "Life and Letters of Charles Darwin," Vol. i, 1887.

96. An early portrait of Darwin after T. H. Maguire. (Ipswich British Association Series, 1849.) The copy shown is from the *Bookman*, Feb. 1909.

97. Two Replicas of the Linnean Society's Darwin-Wallace Medal struck in 1908 to commemorate the fiftieth anniversary of the reading of the joint paper by Darwin and Wallace, at the Society's meeting on July 1st, 1858. The medal was designed by Frank Bowcher, Esq. Seven of the medals were awarded in 1908, the first recipient being A. R. Wallace. Lent by C. E. Fagan, Esq., and B. B. Woodward, Esq.

98. Electrotype of the original wax model from which the Darwin Medal of the Royal Society is reduced. Presented to the Museum by the late Sir John Evans, P.S.A., Treas. Roy. Soc., Feb. 28th, 1891. The Darwin Medal was first awarded in 1890, and the first medallist was A. R. Wallace. The medal was executed by Allan Wyon, Esq.

99. Darwin's study at Down, shortly after his death; etching by A. H. Haig, 1882. Lent by Horace Darwin, Esq., F.R.S.

100. Darwin's study at Down, Kent; photograph by W. England. Lent by Francis Darwin, Esq., F.R.S.

101. Photograph of the statue of Darwin by Sir J. E. Boehm, R.A. The statue is situated on the main staircase of the Museum, and the photograph is reproduced opposite page 7 of this Guide. Photograph by Mr. H. G. Herring.

102. Photograph of Darwin taken by Mrs. Cameron about 1868. Lent by Francis Darwin, Esq., F.R.S. This is reproduced, by kind permission of Mr. John Murray, as the frontispiece of this Guide.

103. Photograph of Darwin, about 1874, taken by Major Leonard Darwin, R.E., Pres. R.G.S. Lent by Horace Darwin, Esq., F.R.S. This portrait was engraved on wood for the *Century Magazine*, January, 1883, and is reproduced in "Life and Letters of Charles Darwin," Vol. ii, 1887.

104. Wood engraving by G. Kruell, 1889, of a photograph of Darwin by Messrs. Elliott and Fry, 1882. Lent by the Linnean Society of London.

105. Photograph of Darwin, enlarged from a negative taken by O. J. Rejlander about 1870.

106. A steel engraving by C. H. Jeens of a photograph of

Darwin by O. J. Rejlander in 1870 (?); published in *Nature*, June 4th, 1874. Presented by Messrs. Macmillan & Co.

107. Three photographs of Darwin by the London Stereoscopic Company, taken about 1864.

108. Four photographs of Darwin by Messrs. Elliott and Fry, taken in 1882, *i.e.* the year of his death.

109. Photograph of the oil painting of Darwin by W. W. Ouless, R.A., 1875, in the possession of W. E. Darwin, Esq.

110. A half-tone reproduction of P. Rajon's etching of the oil painting of Darwin by W. W. Ouless, R.A., 1875, in the possession of W. E. Darwin, Esq. The copy shown is from the *Bookman*, Feb. 1909.

111. Photograph of the oil painting of Darwin by the Hon. John Collier, R.A., 1881, in the possession of the Linnean Society of London. Lent by the Linnean Society.

112. Photograph of Darwin taken by his son, Major Leonard Darwin, between 1872 and 1878. Lent by Major Leonard Darwin, R.E., Pres. R.G.S.

113. Photograph by W. W. Naunton of the statue of Darwin by H. Montford, situated in front of the Old Shrewsbury School (now a Museum and Library).

114. Photograph of the village of Down, enlarged from a negative by G. W. Smith, Esq. Lent by Horace Darwin, Esq., F.R.S.

115. Photograph of Darwin's House at Down. Lent by Horace Darwin, Esq., F.R.S.

FOSSIL BONES COLLECTED BY DARWIN.

In Case **11**, an upright table-case standing across the Entrance of Bay VIII (the third bay or recess on the Eastern side of the Hall counting from the Huxley statue) :—

Fossil bones collected by Darwin in the latter part of the year 1833 and the beginning of 1834, during the voyage of the *Beagle*. They are from the Pampas Formation (Pleistocene) of the Argentine Republic, and the Pleistocene of Patagonia. Darwin presented the bones to the Royal College of Surgeons Museum on his return, and descriptions of them were published by Owen. They are now exhibited here by the courtesy of the Council of the Royal College of Surgeons.

Notable among these remains are two teeth of an extinct Horse

Equus curvidens, the first fossil teeth of a horse-like animal discovered in the New World ; bones and teeth of Great Ground Sloths of the genera *Megatherium*, *Mylodon*, and *Scelidotherium ;* bones of *Macrauchenia ;* and skull of *Toxodon*, a large extinct Ungulate, of the sub-order Toxodontia. Darwin records how he found this particular skull lying in the yard of a farmhouse near the Sarandis, a tributary of the Rio Negro, where the boys had amused themselves by throwing stones at it, and pulling out the teeth. He purchased it, the first discovered relic of the new sub-order, for eighteenpence. A letter from Darwin to Owen concerning this skull is exhibited in Case **1** (No. **6**).

BARNACLES AND CORALS STUDIED BY DARWIN.

In Case **13**, a table-case standing in Bay IX (the second bay or recess on the Eastern side of the Hall counting from the Huxley statue) :—

Specimens of Cirripedia or Barnacles in illustration of Darwin's work on that group. Darwin's Monograph on the Cirripedia, published in 1851–1854, is still one of the chief works of reference on this group of animals. The work was largely based on an examination of the Museum collection, which therefore contains the type-specimens or co-types of most of the new species described by Darwin. The specimens exhibited comprise :—

A. Common types of Cirripedia, stalked Barnacles, sessile Barnacles, etc.

B. Specimens and drawings illustrating special discoveries made by Darwin :—*Proteolepas*, a maggot-like Barnacle, of which only one specimen has been discovered, *Cryptophialus*, another extremely peculiar form, and the complemental males of *Scalpellum*. The great majority of Cirripedes are hermaphrodite, having both sexes combined in each individual. Darwin discovered, however, that certain species have minute males, which are attached like parasites to the hermaphrodite individuals, and to these he gave the name of "complemental males." In a few species the separation of the sexes is complete, and the large individuals are purely female.

C. Specimens described or mentioned in Darwin's work, with some notes in his handwriting. Particular attention is called to the series of *Balanus amphitrite*, a series selected by Darwin himself, with a manuscript of his in which he expresses the difficulty which he experienced in defining the limits of the species.

On the other side of the case are shown specimens of Corals,

Millepores and Nullipores collected by Darwin in 1836 on Keeling Island, an atoll in the Indian Ocean, 800 miles S.W. of Batavia. The series shows corals in the fresh state and in various stages of conglomeration to form the body of the atoll ; also some water-worn coral pebbles. The explanatory account of the specimens is in Darwin's own handwriting : the writing being in places difficult to decipher, a printed copy of it is also shown. Darwin's observations on coral reefs were published in 1842 as the "First Part of the Geology of the Voyage of the *Beagle*—The Structure and Distribution of Coral Reefs" ; and a second edition was published in 1874.

OTHER SPECIMENS COLLECTED BY DARWIN, OR STUDIED BY HIM, OR OTHERWISE CLOSELY CONNECTED WITH HIS WORK.

In Case **6**, the North wall-case in Bay VII, the third recess on the Eastern side of the Hall counting from the Huxley statue, are shown a few of the specimens, other than Corals and Fossil Mammals, collected by Darwin when on the voyage of the *Beagle*.

(The greater part of the collection of natural history specimens was deposited with the Zoological Society, and a selection of the Birds and Mammals was transferred to the British Museum in 1855. The Fishes were sent to Cambridge, and are now in the University Museum of Zoology. The fossil bones were sent to the Royal College of Surgeons Museum, and are shown here in Case **11**, on loan from the College. The fossil Mammal bones were described by R. Owen in Part 1 of the "Zoology of the Voyage of H.M.S. *Beagle*," the recent Mammals by G. R. Waterhouse in Part 2, the Birds by J. Gould (and G. R. Gray) in Part 3, the Fishes by L. Jenyns in Part 4, and the Reptiles by T. Bell in Part 5. The Insects were not described in the *Beagle* reports, but an account of the new species was written by G. R. Waterhouse, and published by the Zoological Society.)

116. A selection of *Beagle* Insects.

117. A small selection of *Beagle* Reptiles and Amphibians. The specimens shown are two species of Lizard, a small Snake, and three tailless Batrachians. Of these last the form known as *Rhinoderma darwinii*, first known to science through Darwin's capture of it, is of particular interest from the exceptionally large size of the gular pouches of the male, a pair of pouches in the floor of the mouth which in this species extend far back beneath the skin of the belly,

and within which the eggs undergo their development, the young frogs emerging from the mouth of the parent on the completion of the metamorphosis.

118. A small selection of *Beagle* Birds, namely three Mocking Birds (*Mimus*).

119. A small selection of *Beagle* Mammals, namely three Opossums and two Murid Rodents.

120. The skin of the Fox which Darwin killed with a geological hammer in the island of San Pedro, South Chili, in 1834. This is the fox of which Darwin writes: "two of the officers landed to take a round of angles with the theodolite. A fox (*Canis fulvipes*) . . . was sitting on the rocks. He was so intently absorbed in watching the work of the officers that I was able, by quietly walking up behind, to knock him on the head with my geological hammer." ("Naturalist's Voyage round the World," Ed. 2, p. 280.)

121. Darwin's geological hammer, probably the one with which he killed the fox, here shown. Lent by W. E. Darwin, Esq.

122. (In the upper part of the case.) Darwin's insect net, with scissor handles. Lent by Sir George H. Darwin, K.C.B., F.R.S.

123. Three fossil Cephalopods described and figured in Darwin's "Geological Observations on South America," 1846, plate 5. *Nautilus d'orbignyanus* and *Baculites vagina* were obtained from the Upper Cretaceous of Chili, and *Ancyloceras simplex* from the Cretaceous of Tierra del Fuego. These specimens were transferred from the Museum of Practical Geology in 1880.

124. (In the upper left-hand corner of the case.) The skull of the Niatu Ox sent to Darwin by Captain Sulivan after the return of the *Beagle*. Lent by the Royal College of Surgeons. The Niatu Cattle of South America show what a great difference in the chances of survival or extinction may be made by a small difference in structure. These cattle, owing to the shortness of the muzzle and the consequent projection of the lower jaw, cannot browse on the twigs and reeds to which other cattle are driven in times of drought, and they perish if not fed by their owners. ("Origin of Species," Chap. vii; "Naturalist's Voyage round the World," Chap. viii, Ed. 2, p. 145.) Another skull (**125**), with the front teeth complete, is shown on the floor of the case.

126. (On the floor of the case.) A Porto Santo Rabbit, a breed of rabbit which in Darwin's opinion had by isolation evolved charac-

ters which distinguished it from the original domestic stock ("Animals and Plants under Domestication," Chap. iv). In 1418 a rabbit on a vessel travelling from Spain to Porto Santo, near Madeira, gave birth to young, which were subsequently turned loose on the island, where, in course of time, they multiplied to such an extent as to become a pest. In 1861 two of the Porto Santo rabbits were brought alive to the Zoological Gardens, and it was noticed that these feral rabbits were, on comparison with English wild rabbits, smaller, more wild, shy and active, more nocturnal, and that they did not exhibit the usual blackish grey fur on the upper surface of the tail and the tips of the ears. Since, further, they refused to mate with English rabbits, it was urged that by isolation the feral rabbits had evolved characters not possessed by the original stock. It is now known, however, that the common rabbit of the countries round the Mediterranean is not the same as the English rabbit, and an error in the argument was introduced by instituting a comparison between the Porto Santo rabbit and the English rabbit, instead of the Spanish rabbit.

127. (On the floor of the case.) A small selection of the Ducks studied by Darwin in the course of his work on Domesticated Animals, and presented by him to the Museum. For Darwin's views on Domestic Ducks see "Animals and Plants under Domestication," Vol. i, pp. 290–302.

128. (On the floor of the case.) A small selection of the Pigeons studied by Darwin in the course of his work on Domesticated Animals. See "Animals and Plants under Domestication," Vol. i, pp. 137–235. The birds here shown represent one-third of the Pigeons presented to the Museum by Darwin in 1867. (A carefully mounted Blue Rock Pigeon and most of the common breeds of Domestic Pigeon are shown in Case **18** in the body of the Hall.)

SPECIMENS ILLUSTRATING DARWIN'S DISCOVERIES, OR ILLUSTRATING PASSAGES IN HIS PUBLISHED WRITINGS, MORE PARTICULARLY THE "ORIGIN OF SPECIES."

(The sequence of the specimens is on the whole based on that of the chapters in the "Origin of Species," but owing to various considerations the rule has not been strictly followed. The sixth edition of the "Origin of Species" was used in the arrangement of

the series, and the references to the chapters given in the labels attached to the specimens refer to that edition. The sixth edition, 1872, is the last edition; copies bearing more recent dates are reprints, differing in pagination, but in no essential respect.)

129. (At the left-hand end of Case **6.**) A skin of a Peacock Pheasant, *Polyplectron malaccense*, in which Darwin found the clue to the evolution of the single notched "eye" of the Peacock's tail feather from the paired ocellus such as is found in the tail feathers of *Polyplectron chinquis* (also shown). In the frame marked Case **5**, near this specimen, are shown Peacock feathers selected and arranged so as to form a graded series, gradation in characters being, as Darwin pointed out, important evidence in arriving at an explanation of the origin of highly complex structures. In connection with these feathers should be studied those of the wings of the Argus Pheasant in Case **10**, on the opposite side of the Bay, showing the rows of "eyes" resembling balls in sockets. At the right-hand end of Case **9** is a photograph (**204**, lent by the University Museum of Zoology, Cambridge) of the fire-screen made from the feathers of the Argus Pheasant referred to by Darwin in his observations on the evolution of ocelli ("Descent of Man," Ed. 2, p. 441).

130. (In the left half of Case **6.**) An Indian Jungle Fowl, *Gallus bankiva*, reputed to be the wild ancestral form of the domestic breeds of Fowl. ("Origin of Species," Chap. i.; "Animals and Plants under Domestication," Chap. vii.) Examples of the principal breeds of Domestic Fowl are shown in Case **21.**

131. Blue Rock Pigeon, *Columba livia*, reputed to be the wild ancestral form of all domestic breeds of Pigeon. ("Origin of Species," Chap. i; "Animals and Plants under Domestication," Chaps. v and vi.) Examples of the principal breeds of Domestic Pigeon are shown in Case **18.** Attention may here be called to the large series of Domestic Animals of all kinds exhibited in the North Hall.

132. Red Grouse of Britain and Willow Grouse of Norway, cited by Darwin as a case in which difference of opinion existed whether the two birds were of distinct species or were local races of one and the same species. ("Origin of Species," Chap. ii, Doubtful Species.) In connection with the question here raised may conveniently be studied the series of Crows in Case **17.** Whether the intermediate forms there exhibited are regarded as having arisen by the interbreeding of two distinct species, or whether the two "species" of Crows are looked upon as dimorphic forms of a single

species, the series is interesting as illustrating the difficulty in defining the limits of a species. The Goldfinches also shown in Case **17** illustrate the same difficulty.

133. A series of thirty-three species of Fresh-water Mussel, *Unio*, from North America. An example of a large or dominant genus which includes a number of very distinct species. ("Origin of Species," Chap. xiv.) The species of the larger genera in each country vary more frequently than the species of the smaller genera. ("Origin of Species," Chap. ii.)

134 (In the upper part of the case.) A series of shells of *Vivipara* (= *Paludina*) of the Pliocene of Slavonia, arranged to show the evolution of ornamented and tuberculated forms in the higher strata from the smooth forms of the lower strata, in accordance with the views of Neumayr and Paul, 1875.

135. A series of shells of a Snail, *Helix picta*, in which the colours and markings of the shell exhibit a wide range of variation within the limits of the species.

136. A series of shells of *Neritina communis*. The colours and markings of the shell exhibit a wide range of variation within the limits of the species, and, as illustrated by the specimens in the bottom row, the same shell may show differences of pattern and colour in its earlier and later parts.

137. A series of shells of *Planorbis multiformis* from the Miocene of Steinheim, showing within the range of the same species a transition from the usual depressed form of shell to the turret form. Similar transitions are known in living species of *Planorbis*. The gradation of the forms of *Planorbis multiformis* in relation with different horizons is referred to in the "Origin of Species," Chap. x.

138. A series of thirty-three shells of *Paludomus loricatus*, from the streams of Ceylon, showing the great variation in size, form, sculpturing, and colouring observable within the limits of the species. Some of the varieties were formerly held to be distinct species, and the names given to the more marked of these have been placed under the examples shown.

139. A series of shells from the Baltic Sea and the North Sea. The Baltic specimens are shown above the corresponding specimens from the North Sea. Darwin suggests that possibly the dwarfing of the shells, admittedly due to the physical conditions of life, might be inherited for at least a few generations, in which case the Baltic

specimens would be called a "variety" of the usual form, such as is found in the North Sea. ("Origin of Species," Chap. ii, Variability.) Presented by the Riksmuseum, Stockholm.

140. Specimens of the Isopod Crustacean *Tanais* or *Leptochelia dubia*. As one of the perplexing differences occurring between individuals of the same species Darwin refers to the statement by Fritz Müller that in *Tanais* there are two forms of males, one with large pincer-claws, and the other with small claws, but with the antennae more abundantly furnished with smelling hairs than in the first kind. ("Origin of Species," Chap. ii.) According to Müller, whose specimens were collected on the coast of Brazil, the two forms of males are not connected by intermediate gradations. Recent investigations on specimens collected at Naples show that intermediate forms do occur between the "high form" *A*, and the "low form" *B*.

141–147. (In the upper part of Case 9.) Seven series of Butterflies selected to illustrate the passages in A. R. Wallace's paper on the Papilionidæ of the Malayan Region (Trans. Linn. Soc., xxv, 1866) referred to by Darwin in Chap. ii of the later editions of the "Origin of Species."

141. Some representative or characteristic species of Butterflies from the Malayan region, belonging to families other than the Papilionidæ.

142. Specimens of *Papilio fuscus* (*P. severus* of Wallace) showing "simple variability." The species occurs in all the islands of the Moluccas and New Guinea, and exhibits in each of them a greater amount of individual difference than often serves to distinguish one species from another.

143. Specimens of *Troides priamus* illustrating "simple variability." In the left upper corner are a male and female from Amboyna, in which island both males and females are constant. Below are one male and two different females from New Ireland, whence a green form of male (not shown here) is also recorded. On the right are two different males and two different females from New Guinea.

144. Polymorphic females in Papilionidæ. In the first column are shown a male and four forms of female of *Papilio polytes*, all from the same locality in Ceylon. The second column shows a male and a "*theseus*" form of female from Sumatra, and below these a male, a "*theseus*" form of female, an intermediate female, and a "*ledebourius*" form of female, all from the Philippine Islands. In

the third column are a male of *Papilio ægeus* and three distinct forms of female (not from the same locality). In the fourth column are examples of seasonal dimorphism in *Araschnia levana*, in which species the second brood differs markedly from the first brood, and intermediate forms occur.

145. Polymorphic Females in Papilionidæ (continued). In the first column are shown a male and two different females of *Papilio memnon* from India; in the second a male and three different females from Java; and in the third column a male and two different females from Borneo.

146. Series of *Papilio agamemnon* illustrating the local races or sub-species occurring in the different islands of the Malay Archipelago. The races are distinguished by differences in size and outline; the differences are tolerably constant in each locality.

147. Series of *Papilio ulysses* illustrating the local races or sub-species occurring in the different islands of the Malay Archipelago. The races are distinguished by differences in the colour-markings, the outline of the wings, and the size of the patches of velvety scales on the fore wings of the males; the differences are constant, each local race being fixed and isolated.

148. (In the upper part of Case 6.) Examples of male and female of the Cock-of-the-Rock, *Rupicola crocea*, a Parrot, *Eclectus cornelia*, the Ruff, *Pavoncella pugnax*, and a Bird of Paradise, *Cicinnurus regius*, showing the differences in the appearance of the two sexes. ("Origin of Species," Chap. iv, Sexual Selection; "Descent of Man," Chap. xiii.) For the aspect of the Ruff at different periods of the year, see Case **22** on the West side of the Hall. Attention may also be directed to the series of Ducks in Case **23**.

149. Three male Stag-beetles, with injuries caused by the mandibles of other males in fighting. ("Origin of Species," Chap. iv, Sexual Selection.)

150–156. A series of Birds in illustration of Darwin's observations on the plumage of the young in comparison with that of the adults. ("Descent of Man," Chap. xvi.)

150. House Sparrow, *Passer domesticus*. The adult male is more conspicuous than the adult female (note the dark throat), and the young in its first plumage resembles the female.

151. Bullfinch, *Pyrrhula europæa*. The adult male is more brilliant than the adult female, and the young resembles the female in dullness of coloration, but differs in the absence of black on the top of the head.

152. *Amydrus blythi*, a Starling of Sokotra. The adult male is less conspicuous than the adult female, and the young resembles the male.

153. Starling, *Sturnus vulgaris*. The adult male and female are alike, and the young has a first plumage peculiar to itself.

154. Kingfisher, *Alcedo ispida*. The adult male and female are brilliant and alike, and the young in its first plumage does not differ from the adults.

155. Red Bishop-bird, *Pyromelana oryx*. The adult male has a brilliant summer plumage, and in the winter is dull and resembles the adult female, which is the same in summer and winter; the young resemble the adults in their winter plumage.

156. *Oreopyra leucaspis*, a Humming-bird of Central America. The adult male differs in coloration from the adult female; the young male resembles the adult male, and the young female the adult female.

157. Specimens of the Elephant-fly, *Tabanus internus*, a fly which, by constantly harassing the Elephant and other large mammals, checks undue increase in their numbers. ("Origin of Species," Chap. xi.)

158. Specimens of the Screw-worm Fly, *Chrysomyia macellaria*. In Paraguay, where the fly is common, horses, cattle, and dogs are prevented from running wild and flourishing in a feral state by the fly laying its eggs in the navel of the new-born young, with usually fatal results when the maggots hatch out. ("Origin of Species," Chap. iii, Struggle for Existence.) As an illustration of the balance maintained in nature, Darwin suggests that if certain insectivorous birds were to decrease in Paraguay, the parasitic insects which probably attack the navel-frequenting fly would increase, and the fly itself would accordingly decrease. The resulting diminished mortality among the cattle would react on the vegetation, thereby influencing the number of herbivorous insects, and thus of insectivorous birds, "and so onwards in ever-increasing circles of complexity."

159. A copy of the diagram drawn up by Darwin to illustrate his views on the evolution of species. The intervals between the horizonal lines represent large units of time, *e.g.*, a thousand generations, and the letters A to L at the bottom of the diagram stand for the several species of a genus occurring at one time in a country. While some of the species suffer extinction in course of time, as does D before reaching the period represented by the third horizontal line

of the diagram; others, such as F, survive unchanged to the end of the whole period which the diagram is supposed to cover. Other species again, such as A and I, are continually branching out into divergent varieties, most of which become extinct; but others persist, and vary again, until at the end of the whole period (represented by the uppermost horizontal line of the diagram) there are eight different species derived from A, and six from I. For a detailed explanation of the diagram, the visitor is referred to "The Origin of Species," Chap. iv.

160–165. A series of blind animals, mostly cave-dwellers. In instituting a comparison between the blind cave-animals of North America and Europe, Darwin laid stress on the fact that in each case the cave-animals are closely related to the animals of the surrounding country. If the blind animals had been special creations adapted for cave-life generally, one would have expected a close similarity in the organisation and affinities of the animals in the New and Old World caves ("Origin of Species," Chap. v, Effects of Use and Disuse).

160. A Cave-rat, *Neotoma pennsylvanica*, from Virginia, U.S.A. The specimens that live in dark caves are blind, but on being brought gradually into increasing intensity of light they slowly acquire a visual perception of objects.

161. *Ctenomys fueginus*, a burrowing Rodent of South America which is frequently blind. Darwin accounts for the reduction in the efficiency of the eyes as due to disuse, aided perhaps by natural selection, for the eyes in subterranean passages are not only useless as organs of vision, but are disadvantageous, in consequence of their liability to inflammation. Other examples of burrowing animals, many of them partially or totally blind, are shown in Case **2**.

162. *Proteus anguinus*, a blind Amphibian of the Caves of Carniola, Austria.

163. Two blind Cave Fishes from the United States, *Typhlichthys rosæ* and *Amblyopsis spelæus*.

164. *Cambarus pellucidus*, a blind Crayfish inhabiting the underground waters of the Mammoth Cave of Kentucky.

165. Several species of *Anophthalmus*, *Bathyscia* and other genera of blind Beetles found exclusively in caves.

166. A series of Dung-beetles, in which the tarsal or terminal joints of the front legs are wanting. In the beetles in the top row

the tarsi are wanting in both sexes ; in the other species exhibited they are absent in the male and very minute in the female. Darwin explains the phenomenon of loss or reduction of the tarsi as due, not to an inheritance of repeated mutilations, but to the effects of long-continued disuse ("Origin of Species," Chap. v, Effects of Use and Disuse). In connection with the disuse of organs in Insects may here be considered the flightless Beetles of Madeira and other islands (**225**, Case **12**), in which the wings have dwindled in size until the power of flight has been lost.

167. A graded series of Lizards of the family Scincidæ showing reduction in the limbs, an illustration of the generalisation that "natural selection will tend in the long run to reduce any part of the organisation as soon as it becomes, through changed habits, superfluous, without by any means causing some other parts to be largely developed to a corresponding degree." ("Origin of Species," Chap. v.)

168. The pelvis and hind limb bones and claws of a large Anaconda Snake, *Boa murina*, an example of vestigial structures. ("Origin of Species," Chap. xiv.)

169. (In the upper part of Case **6**.) A Bat, a Flying Squirrel, and a *Galeopithecus*. Darwin, in his reply to the contention that Bats could not have been evolved from a quadruped animal, because the wings in their early stages of evolution would present no advantage to the possessor, and would therefore not be perpetuated by natural selection, instances the Flying Squirrel and *Galeopithecus* as suggesting how, in the early stages of the evolution of Bats, the wings were but a parachute, a fold of skin extending between the fore and hind limbs on each side and between the fingers, and that the power of flapping this membrane was gradually evolved, and eventually the capacity for true flight. ("Origin of Species," Chap. vi.)

170. The fourth vertebra of the neck and the skeleton of the right fore foot of a Giraffe and an Ox, to show the great length of the bones in the former animal. The height of the Giraffe is instanced by Darwin in his reply to Mivart's contention that "natural selection is incompetent to account for the incipient stages of useful structures." Darwin argued that in times of dearth any slight superiority in height would enable a Giraffe to browse upon twigs inaccessible to others of shorter stature, and the taller animals would thus be more likely to survive and to perpetuate the small increment in height. ("Origin of Species," Chap. vii.)

171. (In Case 8, a small black case on a table at the end of Bay VII.) A series of twelve specimens of Polyzoa to illustrate Darwin's observations on the avicularia and vibracula of these animals.

(The focussing of the microscope is effected by rotating the eye-piece; the slides are brought successively into the field of the microscope by rotating the milled wheel at the right-hand side of the case.)

A. *Fredericella sultana*, a fresh-water species, not uncommon in this country, shown to illustrate the appearance of a Polyzoon in the natural extended position. Each of the individuals of the colony possesses a circlet of tentacles, the cilia of which drive minute food-particles into the mouth, which is surrounded by the tentacles.

In the remaining slides (B—M), the animals are in their retracted condition. The tentacles (not visible in most cases) lie within the cavity of the "zoœcium," the term applied to the units or individual members of the colony. The series illustrates some of the modifications of the avicularia and vibracula, the evolution of which is discussed in Chap. vii of the "Origin of Species." There can be no reasonable doubt that an avicularium is to be regarded as a modified zoœcium, while a vibraculum is an avicularium whose lower, or movable, jaw has been prolonged into a bristle-like structure, the "seta."

B. Part of a colony of a species of *Bugula*, consisting of branches composed of elongated zoœcia arranged in three or four transverse rows. The numerous avicularia are readily recognised by their resemblance to birds' heads. The lower jaw, by means of which the avicularium can grasp a foreign object, corresponds with the lid or operculum of an ordinary zoœcium, with which the avicularium itself corresponds.

This specimen, which, like most of the other slides here shown, has been lent by the University Museum of Zoology, Cambridge, is of special interest in being one of the specimens collected by Darwin during the voyage of the *Beagle*. It may be surmised that Darwin refers to this species, or to one closely allied to it, in Chap. ix of the "Naturalist's Voyage round the World," where he says, "Perhaps the most singular part of their structure is, that when there were more than two rows of cells [zoœcia] on a branch, the central cells were furnished with these appendages [avicularia], of only one-fourth the size of the outside ones," a good illustration of the fact which has often been noted that the observations made during the *Beagle* voyage were the basis of Darwin's later work.

C and D. Fragments of other species of *Bugula*, showing similar avicularia. In D the retracted tentacles and the alimentary canals of the zoœcia are visible.

E. *Beania magellanica*, a species in which the zoœcia are not contiguous, each one bearing a pair of large avicularia near one end.

F. *Bugula reticulata*, an abyssal species in which the avicularia are borne on very long, flexible stalks, and are extremely variable in size in different parts of the same colony.

G–J. Species of *Bicellaria*, a genus allied to *Bugula*. In the species here shown the avicularia are developed to a remarkable extent, and are extremely variable in size.

G. *Bicellaria tuba*, showing the greatly elongated avicularia *in situ* and separated from the branch.

H. *Bicellaria moluccensis*. The muscles by which the lower jaw of the avicularium is closed are readily visible in this preparation. The zoœcia, which have lost their tentacles and internal organs, bear a cylindrical process giving rise to a series of finger-like spines.

J. *Bicellaria pectogemma*. The variation in the size of the avicularia is very striking.

K. *Flustra* (*Sarsiflustra*) *abyssicola*, an example of a species with an entirely different type of avicularium. The avicularia are completely in series with the rest of the units of the colony, but may be distinguished by their relatively gigantic operculum, more or less spoon-shaped, and corresponding with the lower jaw of the avicularia of *Bugula* and *Bicellaria*.

L. A species of *Caberea*, showing the thread-like "setæ" of the numerous vibracula. The "elegant little coralline" referred to by Darwin in Chap. ix of the "Naturalist's Voyage round the World" probably belonged to this genus, which is remarkable for the simultaneous movement of the vibracula of the living colony.

M. A species of *Selenaria*, in which the vibracula are larger and the minute teeth borne by the setæ are more obvious than in L.

172. (In the lower part of Case 9.) Specimens of the pelvic and hind limb bones of the Greenland Right Whale, *Balœna mysticetus*, being three selected from a series of eleven described by Sir John Struthers in the Journal of Anatomy and Physiology, 1881. An illustration of the generalisation that rudimentary (vestigial) parts are apt to be highly variable, the variability resulting apparently from their uselessness, natural selection having no power to check deviations in their structure. ("Origin of Species," Chap. v.)

173. (On the sloping back of the case, towards the left-hand end.) Shells of coral-inhabiting Barnacles of the genus *Pyrgoma*, in which the small valves that close the opening of the shell are unusually different in the different species. An illustration of the contention that unusually developed parts are highly variable. ("Origin of Species," Chap. v.) In the rock barnacles the valves of the shell differ extremely little even in distinct genera.

The large specimen on this tablet is figured in Darwin's "Monograph of the Cirripedia," Vol. ii, pl. 13, fig. 1a.

174. A graded series of eight males and one female of the Atlas Beetle, *Chalcosoma atlas*, showing the extreme variability of the secondary sexual characters of the male. The characters in question are the large size of the horns on the head and thorax, the length of the front legs, and the size of the body as a whole. ("Origin of Species," Chap. v; "Descent of Man," Chap. x.)

175. A graded series of nine males and one female of the Indian Stag-beetle, *Odontolabis cuvera*, showing the extreme variability of the secondary sexual characters of the male. The characters in question are the large size of the head and mandibles, and in a lesser degree the length of the front legs, and the size of the body as a whole. ("Origin of Species," Chap. v.)

176. *Mustela vison*, a North American Polecat, instanced by Darwin in reply to an objection that aquatic carnivores could not have been derived from terrestrial forms because the animals could not have existed in the transitional state. Darwin points out that *Mustela vison* has webbed feet and resembles an otter in its fur, short legs and the form of its tail. During the summer it preys on fish, and during the winter it lives like other polecats on mice and similar land animals. ("Origin of Species," Chap. vi.)

177–180. Specimens of *Saurophagus sulphuratus*, *Puffinuria urinatrix*, *Cinclus aquaticus* and *Colaptes campestris*. One of the great difficulties that Darwin had to contend with in the elaboration of his theory was the fact that the known cases of adaptive modifications in their early stages are extremely scarce. The four birds here shown are mentioned by him as instances in which the observed alteration of habits might in course of time result in a gradually improving adaptive modification of certain parts of the body. ("Origin of Species," Chap. vi.)

177. Tyrant Fly-catcher, *Saurophagus sulphuratus*, a bird of South America which at times hovers like a Kestrel, and at other times dashes into water like a Kingfisher.

178. *Puffinuria urinatrix*, a Petrel which in its habits of diving, swimming and flying resembles the Auks and Grebes rather than its own relatives.

179. Water-ouzel, *Cinclus aquaticus*, a bird allied to the Thrushes, yet differing markedly from them in its habit of diving in water.

180. *Colaptes campestris*, a Woodpecker, possessing the long straight beak, the usual arrangement of the toes, two forward and two backward, for grasping boughs of trees, and the stiff tail feathers to support the body against a tree trunk, yet living on the plains of La Plata where hardly a tree grows, and making its nest in holes in banks.

181. Swim-bladder of a Conger Eel and Lungs of a Monkey. The swim-bladder of Fishes and the lungs of the higher Vertebrates, occupy the same position in the body and are developed in the same manner, but the one serves for flotation and the other for respiration. Darwin points out how a change of function may have been brought about in an organ by *two* organs in the body subserving for a time the same function, which function is gradually transferred from the first or older organ to the newer, and ultimately confined to the newer. He instances the case of the Dipnoan fishes, animals which use the swim-bladder for respiratory purposes alternately with the gills, and thus indicate a transition to the higher Vertebrates in which functional gills do not occur, and the lung is the sole organ of breathing. ("Origin of Species," Chap. vi.)

182. Two embryos of the Fowl, incubated about four days, and an explanatory sketch, showing the transient gill-slits which point to descent from water-breathing ancestors. ("Origin of Species," Chap. vi.)

183. Dissections of eyes of three Cephalopods and a Vertebrate (Horse). In reply to Mivart, who instanced, as one of the difficulties in the way of acceptance of the theory of natural selection, the similarity of structure in the eyes of animals so remotely related as Cuttle-fishes and Vertebrates, Darwin pointed out that though there is a general resemblance between the eyes, there are very fundamental differences. ("Origin of Species," Chap. vi.)

The lens in the eye of the Cuttle-fish is a hardened secretion of the skin, whereas that of the Vertebrate eye is composed of cells of the skin which have coalesced and become transparent. The retina of the Cuttle's eye is directly transformed from the epidermal layer of the skin, whereas that of the Vertebrate eye is developed from

the brain as a hollow outgrowth, the outer part of which becomes inpushed and converted into a cup. Moreover, the manner in which the eye of *Sepia* (C) has probably been evolved from a simple, nearly-closed pit, such as occurs in *Nautilus* (A), is indicated in the condition found in *Ommastrephes* (B). In *Nautilus* there is no lens; in *Ommastrephes* a lens is present, but it is only partially covered over by a layer of skin; while in *Sepia* this layer is complete and transparent, and is known as the cornea.

184. *Sesarma mülleri* and *Ocypoda arenaria*, two crabs belonging to different but related families, and both adapted for living out of the water, although the arrangements for admitting air to the gill-chamber for the purpose of aerial respiration are different in the two cases. ("Origin of Species," Chap. vi.) In *Sesarma mülleri* the carapace can be raised behind so that a slit-like opening into the gill-chamber appears above the last pair of legs; in *Ocypoda arenaria* there is an opening, fringed with hairs, between the third and fourth pairs of legs on each side of the body. The conclusion to be drawn from these facts is that the capacity for breathing air has been acquired independently in the two crabs, the common ancestral form being capable of aquatic respiration only (Fritz Müller).

185. A small series of fruits and seeds as an illustration of Darwin's remark that the same end may be gained by the most diversified means. The end to be gained in the present instance is the conveyance of the seeds to a distance from the parent plant, and this is effected by a modification of the seed-coat or the carpel into a fluff (*e.g.* 1 and 2) or a membrane (*e.g.* 3), such as will enable the wind to carry the seeds to a distance before they reach the ground, or into hooks (*e.g.* 4, 5, and 6), which, by entanglement in the fur of passing animals, will result in the seeds being taken to a distance before they are dislodged. Or the carpels may, on drying, dehisce with such violence as to eject the seeds to a distance (*e.g.* 7 and 8), or they may become sticky when wet so as to cling to the bodies of passing animals (*e.g.* 9). Or the fruits may be of such a nature that, at all events, in a proportion of cases, the seeds are protected from the action of the digestive juices of animals which eat them (*e.g.* 10 and 11). ("Origin of Species," Chap. vi.) A much more extensive series of specimens illustrating the means of dispersal of fruits and seeds is exhibited in the Botanical Gallery.

186. A small series of Lamellibranch shells, selected to illustrate Darwin's remark on the diversity in the form of the hinge and its teeth; an example of the same purpose being served in different

ways in more or less closely related animals. ("Origin of Species," Chap. vi.)

187. Examples of Insects which escape falling a prey to birds and lizards by their resemblance to decayed leaves, twigs and spines. Darwin's reply to Mivart's contention that "as the minute incipient variations will be in *all directions*, they must tend to neutralise one another," is to the effect that, "assuming that an insect happened to resemble in some degree a dead twig or a decayed leaf, and that it varied slightly in many ways, then all the variations which rendered the insect at all more like any such object, and thus favoured its escape, would be preserved, whilst other variations would be neglected and ultimately lost; or, if they rendered the insect at all less like the imitated object, they would be eliminated." ("Origin of Species," Chap. vii, Miscellaneous Objections.) Numerous other instances of Protective Resemblance are shown in Case **7**.

188. Beak of Duck and "whale-bone." The baleen or "whale-bone" of Whales consists of a great number of laminæ or plates of a horny material, which fray out at the edge into bristles and form an efficient strainer. A piece of the baleen of the Humpbacked Whale, *Megaptera boops*, is shown on the floor of this case. In answer to Mivart's question, "How to obtain the beginning of such useful development," Darwin referred to the efficient straining apparatus of the beak of the Shoveller Duck, and pointed to the beak of the Common Duck as an illustration of the manner in which the evolution of such a useful apparatus may have begun. ("Origin of Species," Chap. vii.)

189. Common Cuckoo, *Cuculus canorus*, and a clutch of eggs, including a Cuckoo's egg, taken from the nest of a White-throat. The Cuckoo's eggs are small for the size of the bird; they are laid singly in strange nests, and the young Cuckoo, shortly after hatching, ejects its foster-brothers from the nest. Darwin explains at some length how the habits of the Cuckoo, at first probably casual, may have become regular and intensified by natural selection. ("Origin of Species," Chap. viii.)

190. Cow-bird, *Molothrus bonariensis*, an American bird related to the Starlings rather than to the Cuckoos, but having the habit of laying its eggs in the nests of other birds. It lays several eggs in the strange nest, and thus has not perfected its parasitic habit to the same degree as has the Cuckoo, or even its own relative, *Molothrus pecorus*, which lays but a single egg in the nest, and thus insures

abundance of food for its offspring. ("Origin of Species," Chap. viii.)

A large series of eggs of the Cuckoo and of *Molothrus* is shown on the West Side of the Main Staircase.

191. A series of nests of Hymenoptera, leading up to the exquisitely economical honey-comb of the Hive Bee, in which, for a given size of cell, the expenditure of wax in the manufacture of the walls is reduced to a minimum, the cells being not only hexagonal in section, with single walls dividing adjacent cells, but they are disposed back to back in two layers in such a way that the three pyramidal faces of the end of one cell are walls common to three adjacent cells of the other layer. ("Origin of Species," Chap. viii.) The examples shown are a nest of the Humble Bee and those of two species of *Polistes*, a piece of the honey-comb of the Hive Bee, and an enlarged model of four of the cells.

192. Examples of melanic and albino Mammals. Occasionally there occurs in individual cases an abrupt departure from the usual coloration of a species, the colour in these cases being either very intense or even black—melanic form, or else very pale or white—albino form. ("Origin of Species," Chap. ix.) Numerous examples of melanic and albino animals are shown in Cases **16** and **15**.

193. A small series of bones of the fore limb of Horse-like Ungulates showing how, by the loss of the fifth digit and the shortening of the second and fourth, a form like *Hyracotherium*, of the Eocene, may have given rise to one like *Hipparion*, of the Pliocene ; and how, by a still further reduction of the second and fourth digits to slender splint-bones, the foot of the modern Horse may have been evolved. Darwin suggests that the Tapir, with four toes on the fore limb, though not a direct survival of the ancestor of the Horse, is not very different from the common ancestor of the Tapir and Horse. ("Origin of Species," Chap. x.) For a more extensive series of remains illustrating the ancestry of the Horse the visitor is referred to one of the middle cases in the North Hall. A series of remains illustrating in like manner the line of evolution of the Elephant is on view in the Geological Department.

194. *Nautilus*, an extremely ancient Cephalopod surviving to the present day almost unchanged in character. ("Origin of Species," Chap. xi.)

195. *Lingula*, an extremely ancient type of Brachiopod surviving to the present day almost unchanged in character. ("Origin of Species," Chap. xi.)

196. *Trigonia*, a Mesozoic genus which has escaped extinction. The existing species are confined to the Australian seas ; the range of the fossil forms is, with the exception of those found in the Tertiary rocks of Australia, from the Lias to the Cenomanian (Upper Cretaceous). ("Origin of Species," Chap. xi, Extinction.)

197. (In the lower part of the case.) Specimens of *Lepidosiren*, *Polypterus*, and *Lepidosteus*, solitary modern representatives of groups which flourished in past geological periods. Darwin speaks of these as "living fossils," surviving in fresh waters, where competition is less severe than elsewhere. (It is not clear whether by "*Lepidosiren*" Darwin was referring to the *Lepidosiren paradoxa* of South America or the *Protopterus annectens* of Africa, long known as *Lepidosiren annectens ;* both are therefore shown.) *Ornithorhynchus*, the Duck-bill Platypus, is another example of Darwin's "living fossils." ("Origin of Species," Chaps. iv and xi.)

198. The Tuatara of New Zealand, *Sphenodon punctatus*, as an illustration of the imperfection of the geological record. No remains of members of the family Sphenodontidæ are found later than the Jurassic period, yet *Sphenodon* is living at the present day.

199. Cast of *Archæopteryx macrura*, from the Lithographic Stone (Lower Kimmeridgian) of Eichstädt, Bavaria, as an illustration of the imperfection of the geological record. *Archæopteryx* was not known at the time the first edition of the "Origin of Species" appeared ; in the later editions Darwin observes (Chap. x) that "not long ago palæontologists maintained that the whole class of birds came suddenly into existence during the Eocene period," and remarks that the wide interval between birds and reptiles has now been partially bridged over in the most unexpected manner (Chap. xi).

Particularly impressive as an illustration of the imperfection of the geological record is the fact that the Solenhofen quarries have been worked for some two hundred years, and yet only two specimens of *Archæopteryx* have been discovered, one described in 1862 and the other in 1884. The actual specimen of which the cast is here shown is in the Geological Department of the Museum ; the later discovered specimen is in the Berlin Museum.

200. A small series of Trilobites ; an example of a group of animals becoming abruptly extinct at the close of the Palæozoic period. ("Origin of Species," Chap. xi.)

201. A small series of Ammonites ; an example of a group of animals becoming abruptly extinct at the close of the Mesozoic period. ("Origin of Species," Chap. xi.)

202. A blood-sucking Bat or Vampire, *Desmodus rotundus*, one of the animals which determine the existence of the larger naturalised quadrupeds in several parts of South America. ("Origin of Species," Chap. xi, Extinction.)

203. Some remains of the great extinct Armadillo, *Glyptodon*, of the Pleistocene of South America, for comparison with the exoskeleton of the recent Peba Armadillo; an illustration of the succession of the same types of animal in the same areas. ("Origin of Species," Chap. xi.) In his autobiography Darwin mentions that during the voyage of the *Beagle* he had been deeply impressed by discovering in the Pampas formation great fossil animals covered with armour like that on the existing Armadillos. He could only explain the facts on the supposition that species gradually became modified, and it was this supposition, supported by numerous other items of evidence accumulated on the voyage, which gradually ripened into his theory of the evolution of species by natural selection. ("Life and Letters," Vol. i, p. 82.)

204. Photograph of the fire-screen made from the feathers of the Argus Pheasant referred to by Darwin in "Descent of Man," Ed. 2, p. 441. Lent by the University Museum of Zoology, Cambridge. (See observations on specimen **129**.)

205. (In Case **12**, Bay IX.) Specimens of *Porcellio scaber* from New Zealand. *Porcellio scaber* is a Woodlouse extremely common in Britain, and of wide distribution. In New Zealand it is especially abundant around buildings and in greenhouses, but is rarely met with in the native bush. The evidence points to the conclusion that the species has been introduced into New Zealand by the agency of man. ("Origin of Species," Chap. xi.)

206. *Cancer novæ-zealandiæ*, a crab of New Zealand, closely related to the edible crab of Britain, in illustration of the remark of Dana's quoted by Darwin ("Origin of Species," Chap. xii) :—"It is certainly a wonderful fact that New Zealand should have a closer resemblance in its Crustacea to Great Britain, its antipode, than to any other part of the world." The remark refers particularly to the genera *Cancer* and *Portunus*.

207–212. Ocean-borne seeds collected in various parts of the world, as examples of one of the natural methods by which the flora of an oceanic island becomes established. ("Origin of Species," Chap. xii, Means of Dispersal.)

207. Drift seeds collected by Dr. Guppy on the beach of the Solomon Islands, in the Western Pacific.

208. Drift seeds collected on the beach of the Caroline Islands, in the Western Pacific.

209. Drift seeds collected on the beach of the Admiralty Islands, New Guinea, during the *Challenger* Expedition.

210. Four kinds of seeds picked up on the beach of Cocos Island, and presented by Dr. F. Wood-Jones, 1909. There are no plants on the island producing seeds like these. Seeds similar to these and picked up at the same time have been germinated artificially, and the explanation why the plants have not yet established themselves on the island is that the seeds are not thrown sufficiently high up the beach to find soil for germination.

211. Two kinds of seeds picked up on the beach of Cocos Island, and presented by Dr. F. Wood-Jones, 1909. These are seeds of plants which grow on the island, and it is thus uncertain whether they are drifted specimens or not. The seeds by which the species were originally introduced were evidently sea-borne from a distance.

212. Molucca Beans (*Entada sp.*), seeds of a purely tropical plant picked up on the British Coast. The single specimen in the upper box was found on the Cornish Coast near the Lizard, the other four were collected on the Orkney Islands. They were probably brought from Tropical America by the Gulf Stream.

213. Figure of the foot of a Red-legged Partridge (*Caccabis rufa*), with a clod of dry earth adhering. (Proc. Zool. Soc., 1863.) After the earth had been kept for three years, Darwin broke it up and watered it, and obtained no less than 82 young plants from the seeds contained. He points out how seeds in such accumulations of mud and earth may be carried from one country to another by birds in the course of their migrations. ("Origin of Species," Chap. xii.)

214. Hooked fruits of *Acæna elongata.* Darwin writes :—"In certain islands not tenanted by a single mammal, some of the endemic plants have beautifully hooked seeds ; yet few relations are more manifest than that hooks serve for the transportal of seeds in the wool or fur of quadrupeds. But a hooked seed might be carried to an island by other means ; and the plant then becoming modified would form an endemic species, still retaining its hooks." ("Origin of Species," Chap. xiii.) In this connection the seeds (or, more correctly, the fruits) of the rosaceous plant *Acæna* are interesting as having frequently been found adhering to the feathers of the Albatross, which may thus be a means of introducing the plant into oceanic islands.

215. Seeds taken from the crop of Pigeons (a) in the Admiralty Islands, and (b) in the Solomon Islands. The crop is a part of the alimentary tract in the lower region of the neck of a bird in which food is stored until it is passed on to the gizzard. No digestion takes place in the crop, and seeds may be stored in it unchanged for many hours, during which the bird may fly or be blown in a gale from a continent to a distant island. The accidental death of the bird on arrival might well lead to the seeds germinating and thus establishing on the island plants previously unknown there. ("Origin of Species," Chap. xii, Means of Dispersal.)

216. (On the shelf in the lower part of the case.) A Double Coco-nut or Coco-de-mer, *Lodoicea seychellarum*. Double Coco-nuts are well known in consequence of their being brought home by sailors as curiosities. They are found floating in all parts of the Indian ocean, but the plant itself lives only in the Seychelles Islands. The floating nuts were known to travellers long before the Seychelles were discovered. Recent examination of floating specimens shows them to be hollow, and incapable of germination, so that as an example of the spread of plants by means of the sea the case is not a good one. On the other hand the Coco-nut, *Cocos nucifera*, is equally common, or more so, on the surface of the ocean, and those cast up on distant islands germinate readily.

217. Two ice-borne stones (erratics) from the Boulder Clay of Norfolk. Darwin comments on the fact that since icebergs can carry stones and deposit them at a distance, it is at least possible that they may carry also seeds of plants from a mainland and leave them on some distant island in a condition still capable of germination. ("Origin of Species," Chap. xii.)

218. Dragon-flies of three species, caught at Cocos Island and presented by Dr. F. Wood-Jones, 1909. At certain times of the year, generally after a North wind, dragon-flies are very numerous on the atoll. Yet none of them have been bred on the island; all are immigrants from some mainland, the nearest of which is several hundred miles away. Dragon-flies cannot breed on the island because there are no open tracts of fresh water in which the larval stages of the life-history may be passed.

219. A Locust, *Acridium peregrinum*, one of the locusts mentioned by Darwin as swarming over the island of Madeira in 1844. ("Origin of Species," Chap. xii, Means of Dispersal.) The importance of such visits, Darwin points out, lies not only in the devastation

of the herbage, but in the introduction of new kinds of plants arising from undigested seeds dropped on the island by the locusts.

220. A Locust, *Acridium peregrinum*, one of the swarm that visited Las Palmas, Grand Canary, in 1908. Fifty tons were killed and paid for by weight, and it was estimated that this constituted only one-fourth of the swarm. Allowing 15 specimens to the ounce, there would be about 107,500,000 specimens in the total of 200 tons.

221. *Dytiscus* and *Colymbetes*, water-beetles such as might be instrumental in the conveyance of fresh-water molluscs to distant islands. Darwin speaks of *Dytiscus* caught with the Fresh-water Limpet, *Ancylus*, adhering to it, and he records the capture of a *Colymbetes* on the *Beagle* at a distance of forty-five miles from the nearest land. ("Origin of Species," Chap. xiii, Fresh-water Productions.)

222. Shells of the Fresh-water Limpet, *Ancylus fluviatilis*. Darwin mentions the possibility of the spread of this and other fresh-water molluscs by their adhering to water-beetles and ducks, which may fly across the sea to distant parts. ("Origin of Species," Chap. xiii.)

223. Shells of three species of *Cyclostoma*, land molluscs with an operculum or lid which so effectually closes the mouth of the shell that the animal is not injured by immersion in sea-water. Entangled in drift-wood, the animals may float to distant parts, and may establish themselves on any island upon which they may be cast up. ("Origin of Species," Chap. xiii.)

224. Shells of the Garden Snail, *Helix aspersa*, and the Edible Snail, *Helix pomatia*. These molluscs, though not provided with an operculum, close the mouth of the shell at certain times of the year by an epiphragm, a secretion which hardens in contact with air. Darwin ascertained by experiment that the Edible Snail, when thus sealed, was uninjured by immersion in sea-water for twenty days. ("Origin of Species," Chap. xiii.)

225. A selected series of flightless Beetles from Madeira. Darwin accounts for the occurrence of flightless beetles on oceanic islands as due to natural selection combined probably with disuse of the wings. The individual insects which use their wings to any great extent will be liable to be blown off the island and destroyedat sea, whereas those which, through indolence or through the wings being less perfectly developed, venture less in the air will remain on the island

and perpetuate the deficient mechanism of flight. ("Origin of Species," Chap. v, Effects of Use and Disuse.)

In some island beetles, *e.g.*, *Blaps gages*, in the top row, the wing-covers are fused together. ("Origin of Species," Chap. xiii, Inhabitants of Oceanic Islands.)

226. Specimens of *Mellissius eudoxus*, of St. Helena, a Beetle of interest in being an apterous species of the family Dynastidæ, the other members of which are winged.

227. Four species of Beetles of the sub-family Ectennorhinides, which includes numerous flightless beetles found in oceanic islands, and a single continental form, *Brachyxystus subsignatus*, which is winged.

228. A series of endemic land shells of Madeira, in illustration of Darwin's remark that "Madeira is inhabited by a wonderful number of peculiar land shells, whereas not one species of sea shell is peculiar to its shores." ("Origin of Species," Chap. xiii.)

229. Five species of Bats from Oceanic Islands. Darwin notes that although terrestrial mammals do not occur on oceanic islands, bats are found, and in many instances they are peculiar to an island or a group of islands. The explanation is that the ancestors of the island bats were stragglers from the mainland, carried probably during a gale, and that their descendants have gradually assumed their present distinctive characters in relation to their surroundings. ("Origin of Species," Chap. xiii.) Of the specimens shown, *Pteropus rubricollis* and *Pteropus vulgaris* are endemic in Mauritius and Bourbon, *Pteropus psilaphon* occurs only in the Bonin Islands, *Pteropus keraudreni insularis* is peculiar to the Caroline Islands, and *Notopteris macdonaldi* to the Viti Archipelago.

230. A series of Black Grosbeaks peculiar to the Galapagos Islands, and first discovered by Darwin during the voyage of the *Beagle*. Darwin noted that in several cases different species inhabited different islands of the archipelago, and he further remarked that the nearest relatives of these birds are to be found on the mainland, which one would hardly expect to be the case had the endemic species of the islands been special creations instead of modified descendants of birds which had immigrated from the mainland. ("Origin of Species," Chap. xiii.) In his autobiography Darwin states that it was the peculiarity of the Galapagos fauna, among other things, that first influenced him to question the immutability of species, and started a train of thought which found

expression in the "Origin of Species" some twenty-four years later.

231. A series of Frogs and Tree-frogs from Madeira, the Azores, Mauritius and New Caledonia. ("Origin of Species," Chap. xiii, Absence of Batrachians on Oceanic Islands.) The statement that "frogs have been introduced [*i.e.* by man] into Madeira, the Azores, and Mauritius, and have multiplied so as to become a nuisance" does not, except in the case of the Azores, appear to be supported by evidence. The *Rana esculenta* found in Madeira is a widely-distributed frog of Europe, Asia, and North Africa, and the variety of Tree-frog found in Madeira (*Hyla arborea meridionalis*) is a form common in N.W. Africa. Frogs introduced into the island by man would be more likely to have been brought in by the Portuguese than by the Moors, and one would therefore expect rather a Portuguese variety of Tree-frog than the African. The same Tree-frog also occurs in the Canary Isles. The Frog of Mauritius (*Rana mascariensis*) occurs also in Madagascar, the Seychelles, and other islands, and there is no evidence of its introduction by human agency. On the other hand the Tree-frog of New Caledonia has been definitely ascertained by Layard to have been brought in from Australia.

232. *Galaxias attenuatus*, quoted by Darwin as an important case of a fish occurring in the fresh waters of parts of the world as widely remote as Tasmania, New Zealand, Falkland Islands, and the mainland of South America. ("Origin of Species," Chap. xiii, Geographical Distribution, Fresh-water Productions.) Recent study of the family Galaxiidæ has shown that, as in the case of the Salmonidæ, the fishes are marine fishes of which some have adopted a purely fresh-water habit. *Galaxias attenuatus*, however, although found in brackish and fresh water, breeds in the sea, and its wide distribution is therefore less remarkable than was formerly supposed.

233. A small series of Alpine plants in illustration of Darwin's remark on the similarity of the mountain plants of distant parts of the world, and the absence of such plants from the vast tracts of low ground between. ("Origin of Species," Chap. xii.) *Saxifraga nivalis* and *Saxifraga rivularis* occur on the mountains of Europe, Asia and America, *Gentiana verna* on the mountains of Europe and Asia, and *Gentiana nivalis* on those of Europe and America; yet, except in arctic regions, these plants do not grow below two or three thousand feet above the sea level.

234. Bones of the feet of the Roebuck, Fallow Deer and Ox,

illustrating the generalisation that vestigial structures, probably useless to the possessor, are of value as indicating affinity with animals in which the parts are well developed. The bones of the second and fifth digits are wanting in the Ox; in the Roebuck and Fallow Deer they are present as vestiges, and these vestiges serve to show the affinity that exists between the ruminants and the "pachyderms." ("Origin of Species," Chap. xiv.)

235. Lower jaws of various Marsupials, showing the inflection of the angle, which, prevailing as it does throughout many and different species which have very different habits of life, is valuable evidence of descent from a common ancestor. ("Origin of Species," Chap. xiv, Classification.)

236. Skulls of the Viscacha and *Phascolomys*, showing general resemblance. These animals are cited by Darwin ("Origin of Species," Chap. xiv) in illustration of G. R. Waterhouse's generalisation that when an animal of one group exhibits affinity with another group, the resemblances are general and not special. The Viscacha, for instance, resembles no Marsupial in particular, but Marsupials generally, and the conclusion to be drawn is that the Viscacha has departed from the ancestral form common to the Rodents and Marsupials to a less extent than have other Rodents. Similarly with regard to the Marsupial *Phascolomys*, the Wombat, in its relation with the Rodents. Darwin observes, however, that "it may be strongly suspected that the resemblance is only analogical, owing to the *Phascolomys* having become adapted to habits like those of a Rodent."

237. Electrical Organs in Fishes. Darwin mentions the occurrence of electrical organs in fishes as one of the difficulties in the way of accepting his theory, because the fishes possessing them are not near relatives; because the electrical organs occur in different parts of the body, and differ in the arrangement of the plates, and in the nerve supply; and because it is difficult to see by what graduated steps these organs have been developed in each separate group of fishes, the organ being of no utility for defensive or offensive purposes until fully formed. ("Origin of Species," Chap. vi.) The specimens shown are the Electric Cat-fish, *Malopterurus electricus*; Electric Eel, *Gymnotus electricus*; Electric Ray, *Torpedo hebetans*; and Skate, *Raia batis*.

238. Examples of Insects of two related families of Hymenoptera to show that organs that are constant in form in one family may be of diverse forms in another. ("Origin of Species," Chap. xiv.) In

the upper specimens, of the family Ichneumonidæ, the antennæ are constant in structure, being long and whip-like. In the lower specimens, of the family Tenthredinidæ, the antennæ differ much, and the differences are of subordinate value in classification.

239. Examples of closely allied Insects differing more in their larval than in their mature stages—three species of Shark Moth (*Cucullia*), and two species of Dagger Moth (*Acronycta*), with the caterpillars of each. ("Origin of Species," Chap. xiv.)

240. A Leptalid Butterfly, *Moschnoneura methymna*, bearing a mimetic resemblance to an Ithomiine Butterfly, *Scada phyllodoce*. Both occur in the same parts of South America. The two Butterflies are not closely related, a detailed comparison showing that the resemblance is one of shape and colour mainly. The mimicking Butterfly (*Moschnoneura methymna*) differs considerably in appearance from its relatives, a typical example of which, *Pseudopieris nehemia*, is here shown for comparison. The Ithomia is distasteful to predaceous birds, and the Leptalis is supposed to enjoy a freedom from persecution by its resemblance to the Ithomia. The case is instanced by Darwin as one in which "close external resemblance does not depend on adaptation to similar habits of life, but has been gained for the sake of protection." ("Origin of Species," Chap. xiv, Analogical Resemblances.) Numerous other instances of such protective resemblance are shown in Case **7**.

241. A series of Wasps and Bees, insects that are avoided because of their stings, mimicked by Flies, Moths, Beetles and Neuropterous insects not provided with such weapons. ("Origin of Species," Chap. xiv.) Of particular interest are the two Beetles in the top row, the hinder patches of orange and black being situated on the abdomen in *Hesthesis*, and on the elytra in *Tragocerus*. Other instances are shown in Case **7**.

242. Boring Molluscs, showing similarity of external form. The specimens to the right (*Petricola pholadiformis* and *Coralliophaga coralliophaga*) are closely related molluscs which resemble respectively the genera *Pholas* and *Lithodomus* (specimens to the left), although they are not related to these genera, and although there is no close affinity between *Pholas* and *Lithodomus*. ("Origin of Species," Chap. xiv.)

243. A Mouse, a Shrew and an *Antechinus*, belonging respectively to the Rodentia, Insectivora and Marsupialia, as examples of unrelated animals having the same general appearance. The resemblance is attributed to adaptation for similarly active move-

ments through thickets and herbage, and concealment from enemies. ("Origin of Species," Chap. xiv, Analogical Resemblances.)

244. Skulls of Dog and Thylacine, animals belonging to the Carnivora and Marsupialia respectively, to show the general resemblance in the teeth, attributable to the carnivorous habits of the two animals. The resemblance is a general one only; a detailed comparison of the teeth shows important differences. ("Origin of Species," Chap. xiv, Analogical Resemblances.)

245. Diagrams of the Skeleton of the Fore Limb of Reptiles, Birds, and Mammals, showing that however different the habits of life of these animals, the fundamental type of construction of the limb-skeleton is the same in all. ("Origin of Species," Chap. xiv.) The humerus is coloured blue, the radius and ulna red, the carpal bones green, and the metacarpal bones and the phalanges yellow. Equivalent digits are denoted by similar numerals. Actual specimens of these limbs are to be seen in the cases on the opposite side of the Hall. "How inexplicable is the similar pattern of the hand of a man, the foot of a dog, the wing of a bat, the flipper of a seal, on the doctrine of independent acts of creation! How simply explained on the principle of the natural selection of successive slight variations in the diverging descendants from a single progenitor!" ("Animals and Plants under Domestication," Chap. i.)

246. Preparations of the mouth-parts of a Beetle, a Sphinx Moth and a Bee, with diagrammatic sketches, to show how remarkably different in size and shape are the organs for sucking and biting which have been formed by modification of the mandibles and two pairs of maxillæ. ("Origin of Species," Chap. xiv, Morphology.)

247. The wild Chrysanthemum of China, *Pyrethrum sinense*. This is the wild plant from which all the cultivated varieties known as "Chrysanthemums" have by assiduous cultivation and artificial selection been derived. ("Animals and Plants under Domestication," Chap. xi.)

248. Primrose and Purple Loosestrife. The flowers of the Primrose are of two kinds, one with high stigma and low anthers, and the other with low stigma and high anthers. Darwin, by a series of experiments, found that better seed is produced by pollinating a high stigma flower with pollen from high anthers, and a low stigma with pollen from low anthers, than is produced by pollinating a stigma from anthers at a different level to itself. (Journ. Linn. Soc. 1862.) Darwin also discovered that in the Loosestrife

(*Lythrum*) the stigma and anthers occur at three levels in different flowers. (Journ. Linn. Soc. 1864.) See also specimens in Case **19.**

249. (In the lower part of the left-hand half of the case.) A Sea Iguana, *Amblyrhynchus cristatus*, a lizard of the Galapagos Archipelago, which lives partly on the sea shore and partly in the sea. It is sluggish in its movements, and feeds on sea-weed. ("Naturalist's Voyage round the World," Chap. xvii.)

250. A hybrid between the Common Pheasant, *Phasianus colchicus*, and the Ring-necked Pheasant, *Phasianus torquatus*. This hybrid is cited by Darwin as one of the few hybrids that are fertile. ("Origin of Species," Chap. ix, Degrees of Sterility.) Many other examples of Pheasant hybrids are shown in the North Hall.

251. A female Pheasant, *Phasianus colchicus*, partly albino, assuming male plumage. Presented by H.R.H. the Prince of Wales, 1909. Cases of female birds exhibiting male characters, such as long tail-feathers, hackles, comb, spurs, voice, and pugnacity, are instanced by Darwin in "The Descent of Man," Chap. viii. In most cases the phenomenon is associated with old age, or with disease of, or injury to the generative organs.

SPECIMENS ILLUSTRATING DARWIN'S RESEARCHES ON PLANTS.

In Case **19**, a table-case near the Owen statue, is exhibited a series of models, drawings and specimens illustrating the Fertilisation of Flowers. Instances are given of flowers cross-pollinated by the wind, and by insects; flowers in which self-pollination is impossible because the anthers and stigma of the same flower ripen at different times; flowers in which there are differences in the height of the anthers and stigma in different flowers of the same species, as *Primula* and *Lythrum;* and flowers in which cross pollination by insects is favoured by special floral mechanisms, as the Sage and Orchids. The modern development of the study of this subject was initiated by Darwin's investigations, published in "The Various Contrivances by which Orchids are fertilised by Insects," 1862, and "The Effects of Cross and Self Fertilisation in the Vegetable Kingdom," 1876.

In Case **20**, a table-case near the last, is exhibited a series of models, drawings and specimens of Insectivorous Plants, such as the Bladderwort, Pitcher Plant, Butterwort, Sundew and Venus' Fly-trap. Darwin's book, "Insectivorous Plants," 1875, contains the first detailed account of the remarkable method of nutrition characteristic of these plants. A copy of the book is shown in Case **3.**

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(NATURAL HISTORY).

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April to August (inclusive) ...	,,	6	,,
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November and December ...	,,	4	,,

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January	from	2	to	4	P.M.
February 1 to 14 ...	,,	2	,,	4.30	,,
,, 15 to end ...	,,	2	,,	5	,,
March	,,	2	,,	5.30	,,
April	,,	2	,,	6	,,
May to August (inclusive)	,,	2.30	,,	7	,,
September	,,	2	,,	5.30	,,
October	,,	2	,,	5	,,
November and December	,,	2	,,	4	,,

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